SECTION 00 0101
PROJECT TITLE PAGE

PERMIT PROJECT MANUAL

FOR

HONOR CHARTER SCHOOL

ARCHITECT'S PROJECT NUMBER: DESIGN PROFESSIONAL'S PROJECT NUMBER.

DESIGN-BUILDER'S PROJECT HONOR CHARTER SCHOOL: DESIGN-BUILDER'S PROJECT NUMBER50-26-001 .

8250 BENT GRASS MEADOWS DRIVE

PEYTON, COLORADO 80831

DATE: APRIL 30, 2026

PREPARED BY:

GRACE DESIGN LLC

5/1/2026

SECTION 00 0102
PROJECT INFORMATION

.

PART 1 GENERAL

5.01 PROJECT IDENTIFICATION

A. Project Name: Honor Charter School, located at: 8250 Bent Grass Meadows Drive, Peyton, Colorado 80831.

B. Grace Design Project Number: 68439.

8250 Bent Grass Meadows Dr

Peyton, Colorado 80831

C. The Owner, hereinafter referred to as Owner: Honor Charter School Building Corporation

D. Owner's Project Manager: Tammy Sweeris.
   1. Address: 12577 E. Caley Drive, Centennial, Colorado 80111.
   2. City, State, Zip: Centennial, Colorado 80111.
   3. Phone/Fax: 616.240.3566.
   4. E-mail: tammy@highmarkschools.com.

5.02 PROJECT DESCRIPTION

A. Summary Project Description: Construction of a 46,000 sq. ft. K-8 charter school and associated site improvements..

B. Contract Scope: Construction.

C. Contract Terms: Cost plus a fee, with a guaranteed maximum price (GMP).

5.03 PROCUREMENT TIMETABLE

5.04 PROCUREMENT DOCUMENTS

A. Availability of Documents: Complete sets of procurement documents may be obtained digitally from the Design Build team.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 0107
SEALS PAGE

5/1/2026

END OF SECTION

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END OF SECTION

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SECTION 00 3100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

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

B. Site and Utility Survey: Refer to civil engineering drawings.
   1. This survey identifies grade elevations prepared primarily for the use of Architect in establishing new grades and identifying natural water shed.

C. Geotechnical Report: Entitled VIVID Engineering Group Geotechnical Evaluation Report D25-2-1113, dated March 5, 2026.
   1. Original copy is available digitally from Design Builder.
   2. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
   3. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

3.01 OBTAINMENT OF PERMITS

A. Owner will obtain the following permits, at no cost to the Contractor:
   1. Building Permit for all trades.

B. Building Permit Procedures: When required to obtain this permit:
   1. Complete and file permit application(s) with appropriate agency.
      a. Submit application within five days of the Notice to Proceed.
   2. Pay required fees.
   3. Provide expediting services, either directly or by hiring a firm specializing in these kind of services.
   4. Advise Architect if submission of modified documents is necessary to have the authorities having jurisdiction complete the plan review and approval process. Submit modified documents expeditiously.
   5. Do not commence execution of any item of work for which a permit has not been obtained.

END OF SECTION

Section 00 6290
Electronic data transfer terms and conditions

BY ACCEPTING, TRANSMITTING, STORING, DUPLICATING, DISSEMINATING OR OTHERWISE UTILIZING ANY ELECTRONIC DRAWINGS, MODELS, OR DATA (INDIVIDUALLY AND COLLECTIVELY, “ELECTRONIC DATA”) WHICH WAS ORIGINALLY GENERATED OR DISTRIBUTED BY THE ORCUTT/WINSLOW LIMITED LIABILITY LIMITED PARTNERSHIP, AN ARIZONA LIMITED PARTNERSHIP, AND/OR ITS AFFILIATES, OWNERS, SUBSIDIARIES, AGENTS OR CONSULTANTS (COLLECTIVELY, "ORCUTT | WINSLOW"), THE RECIPIENT ("RECEIVING PARTY") SHALL BE DEEMED TO SIGNIFY ITS ASSENT AND AGREEMENT TO BE BOUND BY THESE ELECTRONIC DATA TRANSFER TERMS AND CONDITIONS (THESE "CONDITIONS"), AND SHALL BE DEEMED TO AGREE THAT ALL SUCH ELECTRONIC DATA ARE INSTRUMENTS OF SERVICE OF ORCUTT | WINSLOW, AND THAT ORCUTT | WINSLOW SHALL BE DEEMED TO BE THE AUTHOR AND OWNER OF SUCH ELECTRONIC DATA AND SHALL RETAIN ALL COMMON LAW, STATUTORY LAW AND OTHER RIGHTS THEREIN, INCLUDING, WITHOUT LIMITATION, ALL RELATED COPYRIGHTS.

IT IS THE RESPONSIBILITY OF THE RECEIVING PARTY TO FULLY UNDERSTAND THE BUILDING(S) (OR OTHER STRUCTURAL COMPONENTS) IN TERMS OF VERTICAL RELATIONSHIPS, STRUCTURAL COMPONENTS, AND BUILDING SYSTEMS BY WAY OF THE APPLICABLE CONTRACT DOCUMENTS PROVIDED BY ORCUTT | WINSLOW. ANY USE OF, OR RELIANCE ON THE ELECTRONIC DATA SHALL BE AT RECEIVING PARTY'S SOLE RISK AND WITHOUT LIABILITY TO ORCUTT | WINSLOW. ANY INFORMATION CONTAINED WITHIN THE ELECTRONIC DATA PROVIDED IS COMPLEMENTARY TO ALL OTHER DOCUMENTS AND AS SUCH IS THEREFORE INHERENTLY INCOMPLETE IN TERMS OF INFORMATION PROVIDED. ANY INFORMATION PROVIDED ELECTRONICALLY THAT IS NOT IN CONFORMITY WITH OTHER CONTRACT DOCUMENTS PROVIDED BY ORCUTT | WINSLOW SHALL BE BROUGHT TO THE ATTENTION OF ORCUTT | WINSLOW FOR CLARIFICATION PRIOR TO PROCEEDING WITH DESIGN OR CONSTRUCTION, AND RECEIVING PARTY'S FAILURE TO DO SO SHALL BE DEEMED TO CONSTITUTE RECEIVING PARTY'S WAIVER OF ITS RIGHT (IF ANY) TO MAKE ANY CLAIM FOR COMPENSATION DUE TO ERRORS OR OMISSIONS IN SAID DOCUMENTS.

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TO THE FULLEST EXTENT PERMITTED BY LAW, RECEIVING PARTY SHALL INDEMNIFY AND HOLD ORCUTT | WINSLOW HARMLESS FOR, FROM AND AGAINST ANY DAMAGE, LIABILITY OR COST, INCLUDING REASONABLE ATTORNEYS' FEES AND COSTS OF DEFENSE, ARISING FROM OR IN CONNECTION WITH ANY CHANGES TO ELECTRONIC DATA MADE BY ANYONE OTHER THAN ORCUTT | WINSLOW OR FROM ANY REUSE OF THE ELECTRONIC DATA WITHOUT PRIOR WRITTEN CONSENT OF ORCUTT | WINSLOW.

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END OF SECTION

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Honor Charter School

B. Owner's Name: Honor Charter School Building Corporation.

C. Architect's Name: Grace DesignStudios.

D. The Project consists of the construction of new ~46,000 s.f. school building and associated sitework.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on the Cost of the Work plus a fee as described in Document 00 5200 - Agreement Form.

1.03 DESCRIPTION OF ALTERATIONS WORK

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

1.04 WORK BY OWNER

A. Owner will award a contract for supply and installation of special systems devices which will have to be scheduled and coordinated by the general contractor..

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

1.05 OWNER OCCUPANCY

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

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

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

D. Schedule the Work to accommodate Owner occupancy.

1.06 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

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

C. Correlation of Contractor submittals based on changes.

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

1.02 RELATED REQUIREMENTS

A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.

B. Section 00 7300 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

C. Section 01 2100 - Allowances: Payment procedures relating to allowances.

D. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form from Procore, edition stipulated in the Agreement.

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

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

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

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

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

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

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

B. Use Procore forms stipulated in the Agreement.

C. Forms shall be notorized.

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

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

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

G. Execute certification by signature of authorized officer.

H. 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.

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

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

K. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 3000.
   2. Construction progress schedule, revised and current as specified in Section 01 3000.
   3. The Contractor shall submit, along with the payment request, notorized conditional lien waivers, the sum of which shall be the amount of the progress payment issued to the Contractor.
   4. Affidavits attesting to off-site stored products.

L. When Architect 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.

1.05 MODIFICATION PROCEDURES

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

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

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

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

F. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, 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. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
   3. 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.

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.

1.06 APPLICATION FOR FINAL PAYMENT

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

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

1. All closeout procedures specified in Section 01 7000.

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

B. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
   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.

1.04 REFERENCE STANDARDS

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

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. 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.
   1. Note explicitly any non-compliant characteristics.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms indicated and included 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:

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. Submittal Form (after award of contract):
   1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request (After Bidding/Negotiating). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Architect will consider requests for substitutions only within 15 days after date of Agreement.

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

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

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

3.04 RESOLUTION

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

B. Architect will notify Contractor in writing of decision to accept or reject request.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

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

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

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

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

2.01 SECTION INCLUDES

A. General administrative requirements.

B. Site mobilization meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Coordination drawings.

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

G. Requests for Interpretation (RFI) procedures.

H. Submittal procedures.

2.02 RELATED REQUIREMENTS

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

B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

2.03 REFERENCE STANDARDS

A. AIA G716 - Request for Information; 2004.

B. AIA G810 - Transmittal Letter; 2001.

C. CSI/CSC Form 12.1A - Submittal Transmittal; Current Edition.

D. CSI/CSC Form 13.2A - Request for Information; Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

4.01 SITE MOBILIZATION MEETING

A. Schedule meeting at the Project site prior to Contractor occupancy.

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

C. Agenda:
   1. Use of premises by Owner and Contractor.
   2. Owner's requirements.
   3. Construction facilities and controls provided by Owner.
   4. Temporary utilities provided by Owner.
   5. Survey and building layout.
   6. Security and housekeeping procedures.
   7. Schedules.
   8. Application for payment procedures.
   9. Procedures for testing.
   10. Procedures for maintaining record documents.
   11. Requirements for start-up of equipment.
   12. Inspection and acceptance of equipment put into service during construction period.

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

4.02 PROGRESS MEETINGS

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

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Special consultants.
   5. Contractor's superintendent.
   6. Major subcontractors.

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

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

4.03 CONSTRUCTION PROGRESS SCHEDULE

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

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

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

D. Submit updated schedule with each Application for Payment.

4.04 PROGRESS PHOTOGRAPHS

A. Submit new photographs at least once a month, within 3 days after being taken.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Completion of site clearing.
   2. Excavations in progress.
   3. Foundations in progress and upon completion.

4. Structural framing in progress and upon completion.
5. Enclosure of building, upon completion.
6. Final completion, minimum of ten (10) photos.

E. Views:
1. Provide aerial photographs from four cardinal views at each specified time, until structure is enclosed.
2. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
3. Consult with Architect for instructions on views required.
4. Provide factual presentation.
5. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

F. Digital Photographs: 24 bit color, minimum resolution of 1600 by 1200 ("2 megapixel"), in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Web link or other agreed upon medium of sharing.
2. File Naming: Include project identification, date and time of view, and view identification.

4.05 COORDINATION DRAWINGS

4.06 REQUESTS FOR INTERPRETATION (RFI)

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

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

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

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of submittals (use procedures specified elsewhere in this section).
b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.

4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
    a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

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

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

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.
5. Identify and include improper or frivolous RFIs.

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

I. 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 within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

4.07 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 3216 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.
   3. Format schedule to allow tracking of status of submittals throughout duration of construction.
   4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   5. 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.

4.08 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

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

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

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

4.09 SUBMITTALS FOR INFORMATION

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

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

4.10 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

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

4.11 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Transmit using approved form.
      a. Use Contractor's form, subject to prior approval by Architect.
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   5. 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.
   6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Deliver submittals to Architect at their business address if physical, or electronically as appropriate.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
      c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
   8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   9. Provide space for Contractor and Architect review stamps.
   10. When revised for resubmission, identify all changes made since previous submission.
   11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   12. 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.
   13. Submittals not requested will not be recognized or processed.
   14. 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. Do not reproduce Contract Documents to create shop drawings.
   3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

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

4.12 SUBMITTAL REVIEW

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

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

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

D. Architect's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Reviewed", or language with same legal meaning.
      b. "Furnish As Noted", 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.
         2) Non-responsive resubmittals may be rejected.
      b. "Rejected".
         1) Submit item complying with requirements of Contract Documents.

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

END OF SECTION

SECTION 01 3329.07
PROHIBITED CONTENT INSTALLER CERTIFICATION

PROJECT NAME: HONOR CHARTER SCHOOL; NO.: 68439.

USE OF THIS FORM

1.01 BECAUSE INSTALLERS ARE ALLOWED AND DIRECTED TO CHOOSE ACCESSORY MATERIALS SUITABLE FOR THE APPLICABLE INSTALLATION, THERE IS A POSSIBILITY THAT SUCH ACCESSORY MATERIALS MIGHT CONTAIN VOC CONTENT IN EXCESS OF THAT PERMITTED, ESPECIALLY WHERE SUCH MATERIALS HAVE NOT BEEN EXPLICITLY SPECIFIED.

1.02 CONTRACTOR IS REQUIRED TO OBTAIN AND SUBMIT THIS FORM FROM EACH INSTALLER OF WORK ON THIS PROJECT.

1.03 FOR EACH PRODUCT CATEGORY LISTED, CIRCLE THE CORRECT WORDS IN BRACKETS: EITHER [HAS] OR [HAS NOT].

1.04 IF ANY OF THESE ACCESSORY MATERIALS HAS BEEN USED, ATTACH TO THIS FORM PRODUCT DATA AND SDS SHEET FOR EACH SUCH PRODUCT.

1.05 VOC CONTENT RESTRICTIONS ARE SPECIFIED IN SECTION 01 6116.

PRODUCT CERTIFICATION

2.01 I CERTIFY THAT THE INSTALLATION WORK OF MY FIRM ON THIS PROJECT:

A. [HAS] [HAS NOT] required the use of ADHESIVES.

B. [HAS] [HAS NOT] required the use of JOINT SEALANTS.

C. [HAS] [HAS NOT] required the use of PAINTS OR COATINGS.

D. [HAS] [HAS NOT] required the use of COMPOSITE WOOD or AGRIFIBER PRODUCTS.

E. DOES NOT include any asbestos.

2.02 ___ LIST OF PRODUCTS OF THESE TYPES THAT WERE USED IS ATTACHED, WITH MANUFACTURER AND BRAND NAME.

2.03 ___ PRODUCT DATA AND SDS SHEETS FOR THESE PRODUCTS:

A. ___ Are attached.

B. ___ Were submitted as normal submittals.

C. ___ Were submitted as sustainable design submittals using the Material Content Form.

CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)

3.01 FIRM NAME: _____

3.02 PRINT NAME: _____

3.03 SIGNATURE: _____

3.04 TITLE: _____ (OFFICER OF COMPANY)

3.05 DATE: _____

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. Testing and inspection agencies and services.

D. Contractor's construction-related professional design services.

E. Contractor's design-related professional design services.

F. Control of installation.

G. Mock-ups.

H. Tolerances.

I. Manufacturers' field services.

J. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 3100 - Available Project Information: Soil investigation data.

B. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.

C. Section 01 2100 - Allowances: Allowance for payment of testing services.

D. Section 01 3000 - Administrative Requirements: Submittal procedures.

E. Section 01 4219 - Reference Standards.

F. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

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

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2025.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2026.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

1.04 DEFINITIONS

A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.

1. Design Services Types Required:

a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

C. 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 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
1. Temporary sheeting, shoring, or supports.
2. Temporary scaffolding.
3. Temporary bracing.
4. Temporary stairs or steps required for construction access only.
5. Investigation of soil conditions and design of temporary foundations to support construction equipment.

1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.
1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
1. Structural Design of Reinforcement Splices: As described in Section 03 0100 - Maintenance of Concrete.
2. Concrete Mix Design: As described in Section 03 3000 - Cast-in-Place Concrete. No specific designer qualifications are required.
3. Structural Design of Steel Connections: As described in Section 05 1200 - Structural Steel Framing.
4. Structural Design of Steel Connections: As described in Section 05 2100 - Steel Joist Framing.
5. Structural Design of Steel Decking: As described in Section 05 3100 - Steel Decking.
6. Structural Design of Metal Framing: As described in Section 05 4000 - Cold-Formed Metal Framing.
7. Structural Design of Steel Trusses: As described in Section 05 4400 - Cold-Formed Metal Trusses.
8. Structural Design of Metal Fabrications: As described in Section 05 5000 - Metal Fabrications.
9. Structural Design of Stairs: As described in Section 05 5100 - Metal Stairs.
10. Structural Design of Railings: As described in Section 05 5213 - Pipe and Tube Railings.
11. Structural Design of Wood Trusses: As described in Section 06 1753 - Shop-Fabricated Wood Trusses

1.07 SUBMITTALS

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

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.

1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
    a. Full name.
    b. Professional licensure information.
    c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
2. Include required product data and shop drawings.
3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
1. Include:
    a. Date issued.
    b. Project title and number.
    c. Name of inspector.
    d. Date and time of sampling or inspection.
    e. Identification of product and specifications section.
    f. Location in the Project.
    g. Type of test/inspection.
    h. Date of test/inspection.
    i. Results of test/inspection.
    j. Compliance with Contract Documents.
    k. When requested by Architect, provide interpretation of results.
2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

E. 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.

F. 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.

G. 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.

H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Contractor's Quality Control (CQC) Plan:
   1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
      a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
         1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
      b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
         1) Managerial continuity and flexibility.

D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.09 REFERENCES AND STANDARDS - SEE SECTION 01 4219

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

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

C. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3740, and other applicable standard..
   2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
   3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
   4. Laboratory: Authorized to operate in the State in which the Project is located.
   5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

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. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Notify Architect and owner fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

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

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

H. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.

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

J. 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. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   6. Perform additional tests and inspections required by Architect.

7. Attend preconstruction meetings and progress meetings.
8. Submit reports of all tests/inspections specified.

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 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.

B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4533
CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Code-required special inspections.

B. Testing services incidental to special inspections.

C. Submittals.

1.02 DEFINITIONS

A. Code or Building Code: ICC (IBC), International Building Code, most recent edition adopted by authority having jurisdiction, including all applicable amendments and supplements without limitation, and specifically Chapter 17 - Special Inspections and Tests.

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

C. NIST: National Institute of Standards and Technology.

D. Special Inspections and Tests: Inspections and testing of materials, installation, fabrication, erection, or placement of components and connections mandated by Building Code to safeguard public welfare.

1. Special inspections and tests are separate from and independent of tests and inspections conducted by Owner or Contractor for purposes of quality assurance and contract administration.

1.03 REFERENCE STANDARDS

A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

B. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

C. IAS AC291 - Accreditation Criteria for Special Inspection Agencies AC291; 2023.

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

1.04 SUBMITTALS

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

B. Special Inspection Agency Qualifications: Prior to start of work, Special Inspection Agency is required to:

1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Submit certification that Special Inspection Agency is acceptable to AHJ.
4. Submit documentation that Special Inspection Agency is accredited by IAS according to IAS AC291.

C. Testing Agency Qualifications: Prior to start of work, Testing Agency is required to:

1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Submit certification that Testing Agency is acceptable to AHJ.
4. Submit documentation that Testing Agency is accredited by IAS according to IAS AC89.

D. Manufacturer's Qualification Statement: When required by AHJ, submit documentation of manufacturing capability and quality control procedures. Include documentation of AHJ approval.

E. Fabricator's Qualification Statement: When required by AHJ, submit documentation of fabrication facilities and methods and quality control procedures. Include documentation of AHJ approval.

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

G. Fabricator Special Inspection Reports: After each special inspection of fabricated items at fabricator's facility, Special Inspector is required to submit report to Architect and to AHJ.

H. Test Reports: After each test or inspection, Testing Agency is required to submit report to Architect and to AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test or inspection.
      h. Date of test or inspection.
      i. Results of test or inspection.
      j. Compliance with contract documents.

I. Certificates: When required by AHJ, Special Inspector will submit certification by manufacturer, fabricator, and installation subcontractor to Architect and AHJ.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and AHJ.

J. Fabricator's Inspection Reports: When required by AHJ, submit reports to Architect and AHJ.

1.05 SPECIAL INSPECTION AND TESTING AGENCY

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

B. Special Inspection Agency may delegate to independent testing agency to perform testing and sampling associated with special inspections and required by building code.

C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of contract documents.

1.06 TESTING AND INSPECTION AGENCIES

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

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

1.07 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:
   1. Independent firm specializing in performing testing and inspections of the type specified in this section.
   2. Accredited by IAS according to IAS AC291.

B. Testing Agency Qualifications:
   1. Independent firm specializing in performing testing and inspections of the type specified in this section.
   2. Accredited by IAS according to IAS AC89.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SPECIAL INSPECTIONS AND TESTING

A. The Code requires special inspections and testing of certain materials, components, assemblies, and connections used in constructing the project. Special inspections and testing will be performed in accordance with the Code.

3.02 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

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

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

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

3.03 TESTING AGENCY DUTIES AND RESPONSIBILITIES

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

6. Submit reports of all tests or inspections specified.

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

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

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

3.04 CONTRACTOR DUTIES AND RESPONSIBILITIES

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

B. Contractor Responsibilities, Wind Force-Resisting System and Wind Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary telecommunications services.

B. Temporary sanitary facilities.

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

D. Security requirements.

E. Waste removal facilities and services.

F. Project identification sign.

1.02 RELATED REQUIREMENTS

A. Section 01 5100 - Temporary Utilities.

B. Section 01 5500 - Vehicular Access and Parking.

C. Section 01 5813 - Temporary Project Signage.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 5100

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

1.04 TELECOMMUNICATIONS SERVICES

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

1.05 TEMPORARY SANITARY FACILITIES

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

B. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

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

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

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

1.07 FENCING

A. Construction: Contractor's option.

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

1.08 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.09 INTERIOR ENCLOSURES

1.10 SECURITY - SEE SECTION 01 3553

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

1.11 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

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

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

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

E. Do not allow vehicle parking on existing pavement.

1.12 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

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

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

D. 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.

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

1.13 PROJECT IDENTIFICATION

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

B. Erect on site at location indicated.

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

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

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

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5100
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 01 5000 - Temporary Facilities and Controls:
   1. Temporary telecommunications services for administrative purposes.
   2. Temporary sanitary facilities required by law.

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. Power Service Characteristics: TBD volt, TBD ampere, three phase, four wire.

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

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

C. Maintain lighting and provide routine repairs.

1.06 TEMPORARY HEATING

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

B. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

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 in areas where construction is in progress, unless indicated otherwise in specifications.

1.08 TEMPORARY VENTILATION

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

SECTION 01 5213
FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary field offices for use of Contractor.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: use of premises and responsibility for providing field offices.

B. Section 01 5000 - Temporary Facilities and Controls:

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.02 CONSTRUCTION

A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

2.03 ENVIRONMENTAL CONTROL

A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.04 CONTRACTOR OFFICE AND FACILITIES

A. Size: For Contractor's needs and to provide space for project meetings.

B. Telephone: As specified in Section 01 5000.

C. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.

D. Other Furnishings: Contractor's option.

E. Equipment: Six adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer .

PART 3 EXECUTION

3.01 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

3.03 MAINTENANCE AND CLEANING

A. Maintain approach walks free of mud, water, and snow.

3.04 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

SECTION 01 5500
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access roads.

B. Parking.

C. Existing pavements and parking areas.

D. Permanent pavements and parking facilities.

E. Construction parking controls.

F. Flag persons.

G. Flares and lights.

H. Haul routes.

I. Traffic signs and signals.

J. Maintenance.

K. Removal, repair.

L. Mud from site vehicles.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: For access to site, work sequence, and occupancy.

B. Section 01 5813 - Temporary Project Signage: Post Mounted and Wall Mounted Traffic Control and Informational Signs.

C. Section 31 2200 - Grading: Specifications for earthwork and paving bases.

PART 2 PRODUCTS

2.01 MATERIALS

A. Temporary Construction: Contractor's option.

B. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base, and topping.

2.02 SIGNS, SIGNALS, AND DEVICES

A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Specified in Section 01 5813 - Temporary Project Signage.

B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

C. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION

3.01 PREPARATION

A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

3.02 ACCESS ROADS

A. Tracked vehicles not allowed on paved areas.

B. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.

C. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.

D. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

E. Provide and maintain access to fire hydrants free of obstructions.

3.03 PARKING

A. Use of existing parking facilities by construction personnel is not permitted.

B. Use of new parking facilities by construction personnel is not permitted.

C. Arrange for temporary parking areas to accommodate use of construction personnel.

3.04 PERMANENT PAVEMENTS AND PARKING FACILITIES

A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.

B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.05 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.06 FLAG PERSONS

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.07 FLARES AND LIGHTS

A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.08 HAUL ROUTES

A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.09 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Relocate as work progresses, to maintain effective traffic control.

3.10 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.11 REMOVAL, REPAIR

A. Remove temporary roads when permanent paving is usable.

B. Repair existing facilities damaged by use, to original condition.

C. Remove equipment and devices when no longer required.

D. Repair damage caused by installation.

3.12 MUD FROM SITE VEHICLES

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

END OF SECTION

SECTION 01 5713
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

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

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

D. Performance bond.

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

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete for temporary and permanent erosion control structures indicated on drawings.

B. Section 31 1000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

C. Section 31 2200 - Grading: Temporary and permanent grade changes for erosion control.

1.03 REFERENCE STANDARDS

A. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

1.04 PERFORMANCE REQUIREMENTS

A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Also comply with all more stringent requirements of State of Colorado Erosion and Sedimentation Control Manual.

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

D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
   1. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.

E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

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

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

H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.

2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

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

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

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

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

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

1.05 SUBMITTALS

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

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

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

D. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 3 EXECUTION

2.01 EXAMINATION

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

2.02 PREPARATION

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

2.03 MAINTENANCE

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

B. Repair deficiencies immediately.

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

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

2.04 CLEAN UP

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

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

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

END OF SECTION

SECTION 01 5813
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

B. Project informational signs.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Responsibility to provide signs.

1.03 REFERENCE STANDARDS

1.04 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.05 SUBMITTALS

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

B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New, metal, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.

E. Lettering: Exterior quality paint, contrasting colors.

2.02 PROJECT IDENTIFICATION SIGN

A. One banner, 48 sq ft area, mounted to project fencing.

B. Content:

1. Name of Prime Contractorarchitect, owner and major Subcontractors.

C. Graphic Design, Colors, Style of Lettering: Designated by Architect.

2.03 PROJECT INFORMATIONAL SIGNS

A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.

B. Provide municipal traffic agency directional traffic signs to and within site.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install sign surface plumb and level, with butt joints. Anchor securely.

3.02 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

C. Section 01 7419 - 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 EXISTING PRODUCTS

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

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

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

2.02 NEW PRODUCTS

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

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

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.

2.03 PRODUCT OPTIONS

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

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

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

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - 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 01 7419.

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

C. Store with seals and labels intact and legible.

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

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

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

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

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

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

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

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

END OF SECTION

SECTION 01 6116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. Requirement for installer certification that they did not use any non-compliant products.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Flooring.
   4. Composite wood.
   5. Products making up wall and ceiling assemblies.
   6. Thermal and acoustical insulation.
   7. Exterior applied products (for LEED Healthcare and Schools projects only).
   8. Other products when specifically stated in the specifications.

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

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

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

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

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Stone.
   2. Concrete.
   3. Clay brick.
   4. Metals that are plated, anodized, or powder-coated.
   5. Glass.
   6. Ceramics.
   7. 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; 2005 (Reapproved 2018).

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2; 2017.

D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; Current Edition.

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

F. CHPS (HPPD) - High Performance Products Database; Current Edition.

G. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.

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

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

J. SCS (CPD) - SCS Certified Products; Current Edition.

K. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.05 SUBMITTALS

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

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

C. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

1.06 QUALITY ASSURANCE

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

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.
      b. Published product data showing compliance with requirements.
      c. Certification by manufacturer that product complies with requirements.

C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scscertified.com.
      b. Report of laboratory testing performed in accordance with requirements.
      c. Published product data showing compliance with requirements.

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

PART 2 PRODUCTS

2.01 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
   2. Inherently Non-Emitting Materials.

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

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

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

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

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

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

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.

F. Section 01 5100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

G. Section 01 5713 - Temporary Erosion and Sediment Control: Additional erosion and sedimentation control requirements.

H. Section 01 7123 - Field Engineering: Additional requirements for field engineering and surveying work.

I. Section 01 7610 - Temporary Protective Coverings: Materials for protection of installed work.

J. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

K. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

L. Section 02 4100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

M. Section 07 8400 - Firestopping.

N. Individual Product Specification Sections:

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 3000 - 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.
6. Include in request:
a. Identification of Project.
b. Location and description of affected work.
c. Necessity for cutting or alteration.
d. Description of proposed work and products to be used.
e. Alternatives to cutting and patching.
f. Effect on work of Owner or separate Contractor.
g. Written permission of affected separate Contractor.
h. Date and time work will be executed.

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

1.05 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,

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

1.06 PROJECT CONDITIONS

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

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Perform dewatering activities, as required, for the duration of the project.

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

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

F. 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.
1. Minimize amount of bare soil exposed at one time.
2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers, pneumatic hammers, air-operated nail guns, and diesel engines.
   2. Outdoors: Limit conduct of especially noisy exterior work to before and after school hours..

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

I. 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.

1.07 COORDINATION

A. See Section 01 1000 for occupancy-related requirements.

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

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

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

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

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

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

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

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

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

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

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

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

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

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

3.02 PREPARATION

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

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

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

3.03 PREINSTALLATION MEETINGS

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

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

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

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

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

3.04 LAYING OUT THE WORK

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

B. Promptly notify Architect of any discrepancies discovered.

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

D. Control datum for survey is that established by Owner provided survey.

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 a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. 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.

K. Periodically verify layouts by same means.

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

M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

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

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

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

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

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

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.

b. See Section 01 1000 for other limitations on outages and required notifications.
c. Provide temporary connections as required to maintain existing systems in service.

4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

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

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

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

3.07 CUTTING AND PATCHING

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

B. See Alterations article above for additional requirements.

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

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

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

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

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

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

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

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

3.08 PROGRESS CLEANING

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

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

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

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

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

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

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

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

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

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. 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.

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

3.10 SYSTEM STARTUP

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

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

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

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

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

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

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

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

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

3.12 ADJUSTING

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

B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.13 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

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, scuppers, overflow drains, 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.

3.14 CLOSEOUT PROCEDURES

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

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

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

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

E. Owner will occupy all of the building as specified in Section 01 1000.

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

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

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

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

3.15 MAINTENANCE

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

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

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

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

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

END OF SECTION

SECTION 01 7123
FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field engineering services by Contractor.

B. Land surveying services by Contractor.

C. Construction surveying by Contractor.

D. Support and bracing.

E. Time-lapse photography.

1.02 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances: Cash, testing, and contingency allowances for field engineering services.

B. Section 01 2300 - Alternates: Bid pricing for field engineering services, if required.

1.03 DESCRIPTION OF SERVICES

A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.

B. Sole responsibility for establishing all locations, dimensions and levels of items of work.

C. Sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.

D. Having a skilled instrument person(s) available on short notice when necessary for laying out the work.

E. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.

F. Provision of facilities and assistance necessary for Architect to check lines and grade points placed by Contractor.
   1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Architect.

G. Preparation and maintenance of daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to Architect.
   1. Number of employees at the Site.
   2. Number employees at the Site for each of Contractor's subcontractors.
   3. Breakdown of employees by trades.
   4. Major equipment and materials installed as part of the work.
   5. Major construction equipment utilized.
   6. Location of areas in which construction was performed.
   7. Materials and equipment received.
   8. Work performed, including field quality control measures and testing.
   9. Weather conditions.
   10. Safety.
   11. Delays encountered, amount of delay incurred, and the reasons for the delay.
   12. Instructions received from Architect or Owner, if any.

H. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.

I. Prior to backfilling operations, surveying - locating, and recording on a copy of Contract Documents - an accurate representation of buried work and Underground Facilities encountered.

J. Setting up and executing time-lapse photography of construction activities.

1.04 REFERENCE STANDARDS

A. FGDC-STD-007.1 - Geospatial Positioning Accuracy Standards - Part 1: Reporting Methodology; 1998.

B. FGDC-STD-007.2 - Geospatial Positioning Accuracy Standards - Part 2: Standards for Geodetic Networks; 1998.

C. FGDC-STD-007.4 - Geospatial Positioning Accuracy Standards - Part 4: Architecture, Engineering, Construction, and Facilities Measurement; 2002.

D. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.

E. State Plane Coordinate System for the State in which the Project is located.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

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

B. Submit in addition to items required in Section 01 7000 - Execution and Closeout Requirements.

C. Informational Submittals: Submit the following:
   1. Field Engineering: Submit daily reports, with content as indicated in this section.
      a. When requested by Architect, submit for Record documentation verifying accuracy of field engineering including, but not limited to, Contractor’s survey notes and field notes.
   2. Final property survey.

1.07 QUALITY ASSURANCE

A. Field Engineer's Qualifications: As established in Section 01 7000 - Execution and Closeout Requirements.

B. Land Surveyor's Qualifications: As established in Section 01 7000 - Execution and Closeout Requirements.

C. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify layout information shown on drawings in relation to property survey and existing benchmarks.

B. Notify Owner’s representative and Architect of discrepancies immediately in writing before proceeding to lay out work.

C. Locate and protect existing benchmarks, base lines, and demarcations. Preserve permanent reference points during construction.

D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.

3.02 FIELD ENGINEERING

A. Maintain field office files, drawings, specifications, and record documents.

B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.

C. Prepare layout and coordination drawings for construction operations.

D. Check and coordinate the work for conflicts and interferences, and immediately advise Architect and Owner of all discrepancies of which Contractor is aware.

E. Cooperate as required with Architect and Owner in observing the work and performing field inspections.

F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.

G. In general, match existing adjacent grades and maintain existing flow lines.

H. Check the location, line and grade of every major element as the work progresses. Notify the Architect when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without Owner’s concurrence of the remediation plan.

I. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment for compliance with shop drawings and Contract Documents requirements.

J. Check all bracing and shoring for structural integrity and compliance with designs prepared by the Contractor.

3.03 LAND SURVEYING

A. General: Follow standards for geospatial positioning accuracy.
   1. FGDC-STD-007.1 as amended by Authority Having Jurisdiction.
   2. FGDC-STD-007.2 as amended by Authority Having Jurisdiction.
   3. FGDC-STD-007.4 as amended by Authority Having Jurisdiction.

B. Coordinate survey data with the State Plane Coordinate System of the State in which the Project is located.

C. Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction-related activities. Any disturbed monuments must be replaced at Contractor’s expense by a surveyor licensed in the State in which the Project is located, and approved by the Architect.
   1. Temporarily suspend work at such points and for such reasonable times as the Owner may require for resetting monuments. The Contractor will not be entitled to any additional compensation or extension of time.

3.04 CONSTRUCTION SURVEYING

A. General: Perform surveying as applicable to specific items necessary for proper execution of work.
   1. Alignment Staking: Provide alignment stakes at 50 foot intervals on tangent, and at 25 foot intervals on curves.
   2. Slope Staking: Provide slope staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. Re-stake at every ten-foot difference in elevation.

B. Record Log: Maintain a log of layout control work. Record any deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.

C. Use by the Architect: The Architect may at any time use line and grade points and markers established by the Contractor. The Contractor's surveys are a part of the work and may be checked by the Architect at any time.

D. Accuracy:
   1. Establish Contractor's temporary survey references points for Contractor's use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.
      a. Accuracy of Other Staking: Plus/minus 0.04 foot horizontally and plus/minus 0.02 foot vertically.
      b. Include an error analysis sufficient to demonstrate required accuracy in survey calculations.
   2. Owner reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.05 SUPPORT AND BRACING

A. General requirements: Design all support and bracing systems, if required. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.

B. Seismic Bracing: Design where required by authorities having jurisdiction.
   1. Design and install all support systems to comply with the seismic requirements of the Construction Code of the State in which the Project is located.
   2. Design and install seismic bracing so as not to defeat the operation on any required vibration isolation or sound isolation devices.
   3. For seismic bracing guidelines for mechanical, electrical and plumbing systems, refer to SMACNA (SRM).

3.06 TIME-LAPSE PHOTOGRAPHY

A. Provide as part of Construction Progress documentation.

B. Set a pole at appropriate location(s), and provide a time-lapse camera to record the entire construction project. Camera (or cameras) is required to provide a field of view of the entire project area.

C. Provide a camera that records at one frame per second rate, or as approved by Architect. Resulting time-lapse will be viewed at standard 25 frames-per-second speed.
   1. Program camera, or provide a timer-controller, to only record during construction work hours.

D. Submit to the Owner and Architect a DVD containing the raw video on a weekly basis. Submit entire digital time-lapse photography record at the conclusion of the project.

3.07 REPORTS

A. Submit two copies of Contractor's daily reports at Architect's field office (or electronically) by 9:00 AM the next working day after the day covered in the associated report. Daily report shall be signed by responsible member of Contractor's staff, such as project manager or superintendent, or foreman designated by Contractor as having authority to sign daily reports.

3.08 RECORDS

A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.
   1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the State in which the Project is located. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by Owner due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.

2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.

B. Submit three copies of final property survey to Owner. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:
   1. Structure locations from property lines, and distances to adjacent buildings.
   2. Dimensions and locations of drives, walks, walls, underground utilities, appurtenances, and major site features.
   3. Location of easements.
   4. Final grading topographic survey.

3.09 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Materials transparency manual.

D. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

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

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

1.03 SUBMITTALS

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

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Materials Transparency Manual:
   1. Compile and submit a digital and a printed version of information disclosing materials content for interior finishes, furnishings (including workstations), built-in furniture. Meet IWBI (BS) requirements for format and content.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

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

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

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.
   6. All changes to the original Contract drawings shall be "clouded". All deletions shall be made by strike-through and clouded.
   7. Seals and signatures of Registrants shall be completely removed and/or permanently obscured.

3.02 OPERATION AND MAINTENANCE DATA

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

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

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

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

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

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

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

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

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

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.

3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

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

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

D. Include color coded wiring diagrams as installed.

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

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
1. Include HVAC outdoor and exhaust air damper calibration strategy.
   a. Include provisions which ensure that full closure of dampers can be achieved.
2. Include Carbon Dioxide Monitoring Protocol.
3. Include Carbon Monoxide Monitoring Protocol.

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

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

I. Include sequence of operation by controls manufacturer.

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

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

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

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

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

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

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

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

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

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

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

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

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.
   4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

3.06 WARRANTIES AND BONDS

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

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

C. Co-execute submittals when required.

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

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

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

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

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

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

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

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

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.

1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
4. Include Commissioning Authority's formal acceptance of training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

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

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

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

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

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

3.02 TRAINING - GENERAL

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

B. Conduct training on-site unless otherwise indicated.

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

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

E. Provide training in minimum two hour segments.

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

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

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

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

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

END OF SECTION

SECTION 03 2000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.

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

C. Section 04 2000 - Unit Masonry: Reinforcement for masonry.

D. Section 04 2613 - Masonry Veneer: Spacing for veneer anchor reglets recessed in concrete.

1.03 PRICE AND PAYMENT PROCEDURES

A. Bar Reinforcement: By the ton. Includes reinforcement, placement, and accessories.

B. Welded Wire Reinforcement: By the square foot. Includes welded wire reinforcement, placement, and accessories.

1.04 REFERENCE STANDARDS

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

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

C. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2024.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.

E. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2024.

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

G. ASTM A1035/A1035M - Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement; 2023a.

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

I. ASTM A1094/A1094M - Standard Specification for Continuous Hot-Dip Galvanized Steel Bars for Concrete Reinforcement; 2020.

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

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

L. CRSI (P1) - Placing Reinforcing Bars, 10th Edition; 2019.

1.05 SUBMITTALS

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

B. Shop Drawings: Comply with requirements of ACI MNL-66 Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

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

1.06 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Plain billet-steel bars.

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

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

2.02 FABRICATION

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

PART 3 EXECUTION

3.01 PLACEMENT

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

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as follows:
   1. Beams: 1 1/2 inch
   2. Supported Slabs and Joists: 3/4 inch.
   3. Column Ties: 1 1/2 inch.
   4. Walls (exposed to weather or backfill): 1 1/2 inch.
   5. Footings and Concrete Formed Against Earth: 3 inch
   6. Slabs on Fill: 3 inch.

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

3.02 FIELD QUALITY CONTROL

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

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floors and slabs on grade.

B. Joint devices associated with concrete work.

C. Miscellaneous concrete elements, including light pole bases, thrust blocks, and manholes.

D. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 2000 - Concrete Reinforcing.

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

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

E. Section 32 1313 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 PRICE AND PAYMENT PROCEDURES

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

B. Concrete - Slab-on-Fill or Slab-on-Grade: Includes formwork as specified in Section 03 1000, reinforcement as specified in Section 03 2000, concrete, placement accessories, consolidating and leveling, troweling, and curing. Measurement by:
   1. Cubic yard.

C. Concrete - Vertical in Forms: Includes formwork as specified in Section 03 1000, reinforcement as specified in Section 03 2000, concrete, placement accessories, consolidating, and curing. Measurement by:
   1. Cubic yard.

D. Concrete - Miscellaneous Locations: Includes formwork as specified in Section 03 1000, reinforcement as specified in Section 03 2000, concrete, placement accessories, consolidating, and curing. Measurement by:
   1. Cubic yard.

E. Concrete - Grouting: Includes preparation of substrate, grout, placement, consolidating, troweling, and curing. Measurement by the cubic yard.

F. Construction Joint Devices: Includes component, accessories, and installation. Measurement by the linear foot.

1.04 REFERENCE STANDARDS

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

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

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

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

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

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

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

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

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

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

K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.

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

M. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

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

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

P. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

Q. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

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

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

T. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2024.

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

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

W. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2023.

X. ASTM C1202 - Standard Test Method for Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration; 2019.

Y. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

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

AA. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.

BB. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork, and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2018 (Reapproved 2023).

CC. ASTM D2103 - Standard Specification for Polyethylene Film; 2023a.

DD. ASTM D8139 - Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction; 2023.

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

FF. 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 2025).

GG. ASTM E1155/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.

HH. 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.

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

JJ. COE CRD-C 48 - Handbook for Concrete and Cement Standard Test Method for Water Permeability of Concrete; 1992.

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.

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

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

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

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

1.06 QUALITY ASSURANCE

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

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

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

1.07 MOCK-UPS

A. Construct and erect mock-up panel for architectural concrete surfaces indicated to receive special treatment or finish as result of formwork.
   1. Panel Size: Sufficient to illustrate full range of treatment.

B. If requested by Architect, cast concrete against mock-up panel. Obtain acceptance of resulting surface finish prior to erecting formwork.

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

1.08 WARRANTY

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

B. Moisture Emission-Reducing Curing and Sealing Compound, Penetrating: Provide non-prorated warranty to cover cost of flooring delamination failures for 20 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. Comply with requirements of Section 03 1000.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

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

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

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

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

E. Structural Fiber Reinforcement: ASTM C1116/C1116M.

2.04 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
   1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   3. Products:
      a. Stego Industries, LLC; Stego Wrap Vapor Barrier: www.stegoindustries.com/#sle.
      b. Minimum thickness 15 mils.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.05 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:

B. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.

C. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.

2.06 CURING MATERIALS

A. Curing and Sealing Compound, Moisture Emission-Reducing, Penetrating: Clear, water-based, non-film-forming curing agent; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission, moisture vapor emission, and alkalinity.
   1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
   2. Compressive Strength of Treated Concrete: Equal to or greater than strength after 28-day water cure when tested according to ASTM C39/C39M.
   3. Chloride Ion Resistance of Treated Concrete: Equal to or greater than strength after 28-day water cure when tested according to ASTM C1202.
   4. Comply with ASTM C309 and ASTM C1315 Type I Class A.
   5. VOC Content: Zero.
   6. UL GREENGUARD Gold certified.
   7. Products:
      a. Sinak Corporation; VC5: www.sinak.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.07 CONCRETE MIX DESIGN

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

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.

1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.

D. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: Interior Floor Slabs on Grade = 4500 psi, Sidewalks and exterior Flatwork = 2500 psi, all others not specifically indicated = 3000 psi.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Water-Cement Ratio: Maximum 40 percent by weight.
   4. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
   5. Maximum Slump: 5 inches.
   6. Maximum Aggregate Size: 5/8 inch.

2.08 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
   1. Colored Concrete: Add pigments in strict accordance with manufacturer's instructions to achieve consistent color from batch to batch.
   2. Fiber Reinforcement: Batch and mix as recommended by manufacturer for specific project conditions.
   3. Expansive Component: Batch and mix as recommended by manufacturer for specific project conditions.

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

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

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

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

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

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

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

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

3.03 PLACING CONCRETE

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

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

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

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

3.04 SLAB JOINTING

A. Locate joints as indicated on drawings.

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

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

D. 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.

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

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

B. Correct the slab surface if tolerances are less than specified.

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

3.06 CONCRETE FINISHING

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

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

D. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include plywood platform flooring with full bed setting system.
   2. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include all other exposed slab surfaces.

3.07 CURING AND PROTECTION

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

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

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. 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-fog spray, or saturated burlap.
   3. Final Curing: Begin after initial curing but before surface is dry.

3.08 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 complying with 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.

3.09 PROTECTION

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

END OF SECTION

SECTION 03 3500
CONCRETE FINISHING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test; 2023.

1.02 SUMMARY

A. Section Includes:
   1. Single application cure-seal-hardener for all new exposed concrete floors.
   2. Precautions for avoiding staining concrete before and after installation.

1.03 REFERENCES

A. ASTM International:
   1. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   2. ASTM C 779 - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
   3. ASTM C 805 - Standard Test Method for Rebound Number of Hardened Concrete.
   4. ASTM C 1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
   5. ASTM D3359 - Standard Test Methods for Measuring Adhesion by Tape Test.

1.04 SUBMITTALS

A. General: Submit listed submittals in accordance with conditions of the Contract and Section 01 3000 - Submittals.

B. Product Data: Submit product data, including manufacturer's data sheets, installation instructions and technical bulletins for specified products.

C. Certificates: Manufacturer's certification that the installer is acceptable.

D. Maintenance Data: Maintenance instructions, including precautions for avoiding staining after application.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Acceptable to the manufacturer.

B. Regulatory Requirements: In accordance with Section 01 4000 - Quality Control.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1, Section 01 6000 - Product Requirements.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

D. Handling: Protect materials from dirt, corrosion, oil, grease and other contaminants.

PART 2 PRODUCTS

2.01 MATERIAL (SC-1)

A. Curecrete Distribution, Inc.
   1. 1203 W. Spring Creek Place, Springville, UT 84663-0551; Ph. (800) 998-5664; www.ashfordformula.com
   2. Or approved equal
   3. Cure-Seal Hardener: Ashford Formula, a water-based chemically reactive penetrating sealer and hardener that seals by densifying concrete so that water molecules cannot

pass through but air and water vapor can, and allows concrete to achieve full compressive strength, minimizing surface crazing and eliminating dusting.

a. Abrasion Resistance to Revolving Disks: At least a 32.5% improvement over untreated samples when tested in accordance with ASTM C 779.
b. Surface Adhesion: At least a 22% increase in adhesion for epoxy when tested in accordance with ASTM D3359.
c. Hardening: As follows when tested in accordance with ASTM C 39:
d. After 7 days: An increase of at least 40% over untreated samples.
e. After 28 days: An increase of at least 38% over untreated samples.
f. Coefficient of Friction: 0.86 dry, 0.69 wet when tested in accordance with ASTM C 1028.
g. Rebound Number: An increase of at least 13.3% over untreated samples when tested in accordance with ASTM C 805.
h. Light Exposure Degradation: No evidence of adverse effects on treated samples when tested in accordance with ASTM G 23.

2.02 PRODUCT SUBSTITUTIONS

A. Substitutions: Substitutions in accordance with Section 01 6000 - Product Requirements.

PART 3 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. Do not begin installation until substrates have been properly prepared and are suitable for application of product.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.03 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.

C. Do not use frozen material. Thaw and agitate prior to use.

D. If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid or other liquids.

3.04 INSTALLATION

A. New Concrete: Apply cure-seal-hardener to new concrete as soon as the concrete is firm enough to work on after troweling; with colored concrete, wait a minimum of 30 days before application.

1. Spray on at rate of 2002 feet/gal.
2. Keep surface wet with cure-seal-hardener for a minimum soak-in period of 30 minutes without allowing it to dry out or become slippery. In hot weather, slipperiness may appear before the 30 minute time period has elapsed. If that occurs, apply additional cure-seal-hardener as needed to keep the entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state. In hot weather conditions, follow manufacturer's special application procedures.
3. When the treated surface becomes slippery after this period, lightly mist with water until slipperiness disappears.
4. Wait for surface to become slippery again, and then flush entire surface with water to remove all cure-seal-hardener residue.

5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
6. Wet vacuum or scrubbing machines can be used in accordance with manufacturer's instructions to remove residue.

3.05 PROTECTION

A. Protect installed floors for at least 3 months until chemical reaction process is complete.
1. Do not allow traffic on floors for 3 hours after application.
2. Do not allow parking of vehicles on concrete slab.
3. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.
4. Do not allow pipe cutting using pipe cutting machinery on concrete slabs.
5. Do not allow temporary placement and storage of steel members on concrete slabs.
6. Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.
7. Clean floor regularly in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 03 4100
PRECAST STRUCTURAL CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floor double tees and channel slabs.

B. Wall panels with integral insulation.

C. Grout packing.

D. Connection and supporting devices.
   1. Lintels and bond beams.

1.02 REFERENCE STANDARDS

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

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

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

D. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products; 2021.

E. PCI MNL-123 - Connections Manual: Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.

1.03 SUBMITTALS

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

B. Product Data: Indicate standard component configurations, design loads, deflections, cambers, and bearing requirements.

C. Shop Drawings: Indicate layout, unit locations, fabrication details, unit identification marks, reinforcement, integral insulation, insulated panel system connectors, connection details, support items, dimensions, openings, and relationship to adjacent materials. Indicate design loads, deflections, cambers, bearing requirements, and special conditions.
   1. Submit reviewed shop drawings and design data to authorities having jurisdiction for approval.

D. Design Data: Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Structural Precast Concrete:
   1. The Wells Companies, Inc..

B. Integrally Insulated Panel System:
   1. The Wells Companies, Inc..

2.02 PRECAST UNITS

A. Precast Structural Concrete Units: Comply with PCI MNL-116, PCI MNL-120, PCI MNL-123, PCI MNL-135, ACI CODE-318, and applicable codes.
   1. Design components to withstand dead loads and design loads in the configuration indicated on drawings and as follows:
   2. Calculate structural properties of framing members in accordance with ACI CODE-318.
   3. Design system to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.

2.03 MATERIALS

A. Cement: Gray Portland type, complying with ASTM C150/C150M, Type I.

2.04 REINFORCEMENT

2.05 REVEAL AND ACCENT STRIPS

A. Manufacturers:
   1. Nox-Crete Inc; Clean Line Reveal: www.nox-crete.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Material: Non-staining, non-reactive, high-density polyethylene.

C. Profile(s): As selected by Architect from manufacturer's standard range.

2.06 INSULATION

A. Integral Insulation: Rigid extruded polystyrene (XPS) board insulation, as specified in Section 07 2100.

B. Non-Conduction Connectors for Integral Insulation: Corrosion- and alkali-resistant connectors designed and manufactured for use in insulated composite panels.

2.07 FABRICATION

A. Comply with fabrication procedures specified in PCI MNL-116.

2.08 FINISHES

A. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.

2.09 ACCESSORIES

A. Connecting and Supporting Devices; Anchors and Inserts: Plates, angles, items cast into concrete, items connected to steel framing members, and inserts complying with PCI MNL-123 and as follows:
   1. Material: Carbon steel complying with ASTM A36/A36M.
   2. Finish: Prime painted, except where device surfaces will be in contact with concrete or will require field welding.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and field measurements are as indicated on shop drawings.

3.02 ERECTION

A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

3.03 PROTECTION

A. Protect members from damage caused by field welding or erection operations.

3.04 CLEANING

A. Clean weld marks, dirt, or blemishes from surface of exposed members.

END OF SECTION

SECTION 03 5413.11
GYPSUM CEMENT UNDERLAYMENT - MAXXON CORPORATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gypsum cement floor underlayment.

1.02 REFERENCE STANDARDS

A. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.

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

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.03 SUBMITTALS

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

B. Manufacturer's Instructions: Indicate surface preparation.

C. Applicator's qualification statement.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience and approved by manufacturer.

1.05 FIELD CONDITIONS

A. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during, and 72 hours after installation of underlayment.

1.06 WARRANTY

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

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for defective materials. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Cement Underlayment:
   1. Maxxon Corporation; Gyp-Crete High Performance: www.maxxon.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Sound Control Mat:
   1. Maxxon Corporation; Acousti-Mat 1/4: www.maxxon.com/#sle.

2.02 MATERIALS

A. Gypsum Cement Underlayment: Gypsum-based mix producing the following properties when mixed with water in accordance with manufacturer's directions:
   1. Compressive Strength: Minimum 2,500 psi in accordance with ASTM C472.
   2. Density: Maximum 115 pcf.
   3. Thickness: as specified on structural drawings, minimum 3/4 inch to maximum 3 inches.
   4. Surface Burning Characteristics: Flame spread/smoke developed index of 0/0 in accordance with ASTM E84.

B. Sound Control Mat: Sheet-rolled, styrene butadiene rubber mat, attached to water-resistant nonwoven fabric.
   1. Thickness: 1/4 inch.

C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

D. Joint and Crack Filler: As recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrates are structurally sound and surfaces are clean, dry, and do not contain petroleum byproducts or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

A. Remove substrate surface irregularities; fill voids and deck joints with filler. Finish smooth and vacuum surfaces.

B. Prime substrates and allow to dry in accordance with manufacturer's instructions.

3.03 INSTALLATION

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

B. Install in accordance with manufacturer's written instructions.

C. Add aggregate for areas where thickness exceeds 1/2 inch. Mix underlayment and water for minimum two minutes before adding aggregate, and ensure aggregate is coated by continuously mixing.

D. Place to indicated thickness, with top surface level to 1/8 inch in 10 feet.

3.04 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit foot traffic over unprotected floor surface until installed surfaces are set for 4 hours minimum.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Mortar and grout.

C. Reinforcement and anchorage.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.

B. Section 04 0100 - Maintenance of Masonry.

C. Section 04 0511 - Masonry Mortaring and Grouting.

D. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

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

1.03 REFERENCE STANDARDS

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

B. ASTM C55 - Standard Specification for Concrete Building Brick; 2023.

C. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.

D. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.

E. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2024a.

F. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2024.

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

H. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.

I. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

L. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025.

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

N. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2022.

O. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2024.

P. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.

Q. ASTM E11 - Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves; 2024.

R. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.

S. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

T. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems; 2021, with Editorial Revision (2022).

U. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

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

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit two samples of CMU units to illustrate texture.

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

E. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

F. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

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

1.07 MOCK-UPS

A. Construct a masonry wall as a mock-up panel sized 4 feet long by 2 feet high; include mortar and accessories in mock-up.

B. Locate where directed.

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

1.08 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches.
   2. Load-Bearing Units: ASTM C90, normal weight.
      a. Exposed Faces: Texture, split faced on outside face.
   3. Units with Integral Water Repellent: Concrete block units as specified in this section with polymeric liquid admixture added to concrete masonry units at time of manufacture.
      a. Performance of Units with Integral Water Repellent:
         1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
            (a) No water visible on back of wall above flashing at the end of 24 hours.
            (b) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
            (c) No more than 25 percent of wall area above flashing visibly damp at end of test.
         2) Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.

3) Compressive Strength: ASTM C1314; maximum 5 percent decrease.

b. Use only in combination with mortar that also has integral water repellent admixture.

c. Use water repellent admixtures for masonry units and mortar by a single manufacturer.

2.02 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M, Type N.

B. Grout Aggregate: ASTM C404.

C. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.

1. Use only in combination with masonry units manufactured with integral water repellent admixture.
2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
3. Meet or exceed performance specified for water repellent admixture used in masonry units.

D. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

2.03 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: Type _____ , as specified in Section 03 2000; size as indicated on drawings; galvanized finish.

B. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.

C. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.

1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

2.04 FLASHINGS

A. Metal Flashing Materials: As specified in Section 07 6200.

2.05 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Weeps:

1. Type: 3/8" plastic tube x depth of masonry.

C. Termite-Excluding Weep and Vent:

1. Type: Polytetrafluoroethylene (PTFE) vent body with stainless-steel mesh closure.
2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
3. Stainless Steel Mesh: ASTM E11 ; opening size 0.018 inch, maximum.

D. Drainage Fabric: Polyester or polypropylene mesh bonded to a water and vapor-permeable fabric.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.

1. Masonry below grade and in contact with earth: Type S.
2. Exterior, loadbearing masonry: Type N.
3. Exterior, non-loadbearing masonry: Type N.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

3.03 COLD AND HOT WEATHER REQUIREMENTS

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

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: As indicated for different locations.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay hollow masonry units with face shell bedding on head and bed joints.

B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

C. Remove excess mortar and mortar smears as work progresses.

D. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches.

F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

G. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

H. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.07 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.
   1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Install flashing in accordance with manufacturer's instructions.

C. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

3.08 GROUTED COMPONENTS

A. Lap splices minimum 24 bar diameters.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

C. Place and consolidate grout fill without displacing reinforcing.

3.09 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

D. Form expansion joint as detailed on drawings.

3.10 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.11 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation from Alignment of Columns: 1/4 inch.

C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

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

E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.12 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.13 PARGING

A. Dampen masonry walls prior to parging.

B. Scarify each parging coat to ensure full bond to subsequent coat.

C. Steel trowel surface smooth and flat with a maximum surface variation of 1/8 inch per foot.

D. Strike top edge of parging at 45 degrees.

3.14 FIELD QUALITY CONTROL

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

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.15 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

3.16 PROTECTION

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

END OF SECTION

SECTION 04 2616
ADHERED MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured stone.

B. Mortar.

C. Adhesives.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting.

B. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

1.03 REFERENCE STANDARDS

A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

B. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring; 2023.

C. ASTM C847 - Standard Specification for Metal Lath; 2018 (Reapproved 2024).

D. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2024.

E. ASTM C1670/C1670M - Standard Specification for Adhered Manufactured Stone Masonry Veneer Units; 2021b.

F. ASTM C1780 - Standard Practice for Installation Methods for Cement-Cased Adhered Masonry Veneer; 2020.

G. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

H. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

1.04 SUBMITTALS

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

B. Product Data: Provide data for masonry units, mortar, grout, and adhesive.

C. Samples: Submit four samples of masonry units to illustrate color, texture, and extremes of color range.

1.05 MOCK-UPS

A. Construct a mock-up panel sized 8 feet long by 6 feet high; include mortar, grout, adhesives, accessories, substrate, and representative wall openings in mock-up.

B. Mock-up may remain as part of the Work.

1.06 FIELD CONDITIONS

A. Do not install adhesives in an unventilated environment.

B. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MANUFACTURED STONE

A. Manufacturers:
   1. Coronado Stone: Classic Series Jerusalem Sahara Blend 8x16" basis of design.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Manufactured Stone: ASTM C1670/C1670M.

1. Average Compressive Strength of Five Specimens: 2,100 psi, minimum, with individual specimens having a minimum measured compressive strength of 1,800 psi.
2. Shear Bond Strength: Minimum 50 psi.
3. Saturated Density: Not exceeding 15 psf.
4. Linear Drying Shrinkage: Not exceeding 0.10 percent.
5. Color, Texture, Range, Special Shapes: As indicated on drawings.

2.02 ADHESIVE MATERIALS

A. Manufacturers:
1. Bostik Inc; ____: www.bostik-us.com/#sle.
2. LATICRETE International, Inc; LATICRETE MVIS Hi-Bond Veneer Mortar: www.laticrete.com/#sle.
3. Parex USA Inc; Thin Veneer Adhesive: www.parexusa.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MORTAR MATERIALS

A. Mortar and Grout: Per manufacturer's recommendations.

2.04 FLASHINGS

A. Stainless Steel: ASTM A666/A666M, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

2.05 LATH

A. Diamond Mesh Metal Lath: ASTM C847, galvanized; _____.
1. Weight: To suit application _____ and as specified in ASTM C841 for framing spacing.
2. Weight: 2.5 lb/sq yd, minimum.
3. Backed with treated paper.

2.06 ACCESSORIES

A. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

B. Water-Resistive Barrier: See Section 07 2500.

C. Insulation: Manufacturer's standard; {CH#244689} thick, rigid, expanded polystyrene (EPS) insulation board with integral drainage channels.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field conditions meet masonry manufacturer's requirements to receive masonry veneer.

3.02 INSTALLATION

A. Manufactured Stone: Install in accordance with ASTM C1780.

B. Water Resistive Barrier: install 2 layers over exterior gypsum sheathing per manufacturer's recommendations.

C. Insulation with drainage channels: Install over Weather Resistive Barrier per manufacturer's recommendations.

D. Install lath and furring for Portland cement plaster in accordance with ASTM C1063.

E. Lath Installation:
1. Apply metal lath taut, with long dimension perpendicular to supports.
2. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.
3. Lap sides of diamond mesh lath minimum 1-1/2 inches.
4. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.
5. Place corner bead at external wall corners; fasten at outer edges of lath only.

6. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.
7. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.
8. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.03 COURSING

A. Establish lines, levels, and coursing as indicated on drawings. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Manufactured Stone: Follow pattern as indicated on drawings.

3.04 MASONRY FLASHINGS

A. Whether or not specifically indicated on drawings, install masonry flashing to divert water to exterior at locations where downward flow of water is interrupted.
   1. Extend flashings full width at such interruptions at least 6 inches, minimum, to form watertight pan.
   2. Provide appropriate flashing to divert water from drainage channels in insulation to exterior.

3.05 CONTROL AND EXPANSION JOINTS

A. Form control joints as detailed on drawings and as recommended by manufacturer, not less than 20'-0" o.c.

3.06 CLEANING

A. Clean soiled surfaces with cleaning solution.

3.07 PROTECTION

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

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall framing.

B. Exterior wall sheathing.

C. Formed steel joist and purlin framing and bridging.

D. Water-resistive barrier over sheathing.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking.

B. Section 07 2100 - Thermal Insulation: Insulation within framing members.

C. Section 07 9200 - Joint Sealants.

D. Section 09 2116 - Gypsum Board Assemblies: Cold-formed steel nonstructural framing.

E. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

F. Section 09 2216 - Non-Structural Metal Framing.

G. Section 09 5100 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

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

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

E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

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

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

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

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

J. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).

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

L. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2021).

M. PS 1 - Structural Plywood; 2023.

N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

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

B. Product Data: For lateral-force resisting systems, provide product data sheets on hold-down, showing compliance with requirements.

C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.

D. Designer's Qualification Statement.

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

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a professional structural engineer experienced in designing this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

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

2.02 MATERIALS

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

2.03 STRUCTURAL FRAMING COMPONENTS

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

B. Purlins: AISI S240; manufactured c-shaped sections.

2.04 MISCELLANEOUS CONNECTIONS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized per ASTM A153/A153M.

B. Welding: Comply with AWS D1.1/D1.1M.

2.05 SHEATHING

A. Plywood; PS 1, Grade C-D, Exposure I.

B. Gypsum Board Wall Sheathing: See Section 09 2116.

C. Extruded polystyrene (XPS) board insulation, ASTM C578, Type IV, tongue and groove along edges; 3/4 inch thick.

2.06 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

D. Water-Resistive Barrier: ICC-ES AC38 Grade D and 60-minute plastic sheet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION - GENERAL

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

3.03 INSTALLATION OF STUDS

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

B. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.

C. Install load-bearing studs; brace, and reinforce to develop full strength and achieve design requirements.

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

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

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

G. Attach cross studs to studs for attachment of fixtures anchored to walls.

H. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

I. Touch-up field welds and damaged corrosion protected surfaces with primer.

3.04 INSTALLATION OF JOISTS AND PURLINS

A. Place joists at 12 inches on center; not more than 2 inches from abutting walls, and connect joists to supports using fastener method.

B. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.

C. Locate joist end bearing directly over load-bearing studs or provide load distribution on top of stud track.

D. Provide web stiffeners at reaction points.

E. Touch-up field welds and damaged primed surfaces with primer.

3.05 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.
   2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges, and ends.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

B. Downspout boots.

C. Food serving window sill

D. Food Service Tray Slide

E. Structural accessory items

1.02 RELATED REQUIREMENTS

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

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 5100 - Metal Stairs.

D. Section 05 5133 - Metal Ladders.

E. Section 07 7123 - Manufactured Gutters and Downspouts: Downspout boots.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

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

F. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

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

I. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.

J. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

K. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

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

M. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2021.

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

O. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

P. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

Q. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.

R. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings; 2018, with Editorial Revision.

S. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

T. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.

U. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

V. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

W. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.

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

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

Z. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

AA. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

BB. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

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

DD. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.

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

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Stainless Steel, General: ASTM A666/A666M, Type 304.

F. Stainless Steel Tubing: ASTM A554, Type 304, 16 gauge, 0.0625 inch minimum metal thickness, 1-1/2 inch diameter.

G. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.

H. Slotted Channel Fittings: ASTM A1011/A1011M.

I. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

J. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

K. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

L. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

M. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

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

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.

D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

E. Aluminum-Alloy Sand Castings: ASTM B26/B26M.

F. Aluminum-Alloy Die Castings: ASTM B85/B85M.

G. Bolts, Nuts, and Washers: Stainless steel.

H. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

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

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

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

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

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

2.04 FABRICATED ITEMS

A. Food Serving window sill: Stainless Steel bent plate; polished finish finish.
   1. Width: as required to completely encase wall below and extend under bottom of coiling curtain on kitchen side of opening.
   2. Height: 1 1/2" minimum turndown along both sides.
   3. Close off openings at each end and return turndown back to walls.

B. Food Serving Window tray rail: 4-tube 12 inch wide by 74 inch long foldable stainless steel tray rail assembly model 37524-2-C Tray Slide as manufactured by Vollrath or approved equal.

C. Joist Hangers: Strap anchors, fabricated with sheet steel, 18 gauge, 0.0478 inch minimum base metal thickness; galvanized finish.

D. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

E. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

F. Door Frames for Overhead Door Openings: Channel sections; prime paint finish.

G. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

H. Toilet Partition Suspension Members: Steel channel sections; prime paint finish.

I. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.

2.05 DOWNSPOUT BOOTS

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Finish: Manufacturer's standard factory applied powder coat finish.
   4. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.

2.06 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

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

G. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

H. Stainless Steel Finish: No. 4 Bright Polished finish.

2.07 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I color anodized.

B. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick; dark bronze.

C. Pigmented Organic Coating System: AAMA 2603 polyester or acrylic baked enamel finish; color as selected from manufacturer's standard colors.

D. High Performance Organic Coating System: AAMA 2604 multiple coat, thermally cured fluoropolymer system; color as selected from manufacturer's standard colors.

E. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; color as selected from manufacturer's standard colors.

2.08 FABRICATION TOLERANCES

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

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

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

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

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

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

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

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

C. Field weld components as indicated on drawings.

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

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

F. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

3.04 TOLERANCES

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

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

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

END OF SECTION

SECTION 05 5100
METAL STAIRS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete fill in stair pans and landings; mesh reinforcement for landings.

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 5213 - Pipe and Tube Railings: Metal handrails and balusters other than specified in this section.

D. Section 10 1400 - Signage: Photoluminescent markings.

1.02 REFERENCE STANDARDS

A. AISC 207 - Standard for Certification Programs; 2025.

B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2024b.

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

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

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

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

G. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2025a.

H. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

I. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

J. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

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

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

M. 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; 2024.

N. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

O. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.

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

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

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

S. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.

T. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

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

V. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.03 SUBMITTALS

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

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

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

1.04 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

B. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.
   2. A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
   3. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Dimensions: As indicated on drawings.
   4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.
      b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
      c. Exposed Edges and Corners: Eased to small uniform radius.
      d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: as noted in the drawings in inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch minimum.
   4. Concrete Reinforcement: Welded wire mesh.
   5. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
   1. Nosing Depth: Not more than 1-1/2 inch overhang.
   2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: as noted in the drawings.
   1. Stringer Depth: As indicated on drawings.

F. Railings: Steel pipe railings.

G. Finish: Shop- or factory-prime painted.

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: See Section 05 5213.

B. Guards: Pipe railings, see Section 05 5213.

2.04 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.

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

F. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

G. Perforated Plate:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.
   2. Stainless Steel Sheet: ASTM A240/A240M, Type 304, No. 2D cold rolled, dull finish.
   3. Perforation Pattern: Square hole, 1/8 inch by 1/8 inch, staggered pattern.

H. Concrete Fill: See Section 03 3000.

I. Concrete Reinforcement: Drawings indicated type as detailed, galvanized.

2.05 ACCESSORIES

A. Factory Fabricated Stair Tread and Nosing:
   1. Materials: Steel.
      a. Tread Abrasive: Cross-hatched silicon carbide abrasive 20 grit.
      b. Finish: As indicated on drawings.

B. Steel Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

C. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

E. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

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

2.06 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
   2. Number of Coats: One.

D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
   1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

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

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

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

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.03 TOLERANCES

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

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

END OF SECTION

SECTION 05 5133
METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop-fabricated metal ladders.

1.02 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; Current Edition.

B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

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

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

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

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

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

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.

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

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

L. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

M. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

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

O. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.03 SUBMITTALS

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

B. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.04 QUALITY ASSURANCE

A. Design metal ladders under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

F. Bolts, Nuts, and Washers: ASTM A307, plain.

G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

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

2.02 FABRICATION

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

B. Fabricate items with joints tightly fitted and secured.

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

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

2.03 FABRICATED LADDERS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 by 2 inches members spaced at 20 inches.
   2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.

2.04 FINISHES - STEEL

A. Prime paint steel items.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

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

2.05 FABRICATION TOLERANCES

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

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

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

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

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

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

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

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

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

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

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

B. Section 04 2000 - Unit Masonry: Placement of anchors in masonry.

C. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

D. Section 10 1400 - Signage: Photoluminescent markings.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. AISC 207 - Standard for Certification Programs; 2025.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

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

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

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

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

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

I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

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

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

C. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.
   2. A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
   3. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

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

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

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

E. Dimensions: See drawings for configurations and heights.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
   3. For anchorage to stud walls, provide backing plates, for bolting anchors.

G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.

C. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

D. Exposed Fasteners: No exposed bolts or screws.

E. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

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

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

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

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

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ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.
B. Rough opening framing for doors, windows, and roof openings.
C. Roofing nailers.
D. Roofing cant strips.
E. Preservative treated wood materials.
F. Fire retardant treated wood materials.
G. Miscellaneous framing and sheathing.
H. Communications and electrical room mounting boards.
I. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
C. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
D. Section 07 2700 - Air Barriers: Air barrier over sheathing.
E. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.
F. Section 07 7200 - Roof Accessories: Prefabricated roof curbs.
G. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.
H. Section 31 3116 - Termite Control: Field-applied termiticide and mildewcide for wood materials.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2024).
D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.
F. PS 1 - Structural Plywood; 2023.
G. PS 20 - American Softwood Lumber Standard; 2025.
H. WWPA G-5 - Western Lumber Grading Rules; 2025.

1.04 SUBMITTALS

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

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

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

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

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

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

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractor, 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 DELIVERY, STORAGE, AND HANDLING

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

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.07 WARRANTY

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

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.

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. 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, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
   1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Do not use treated wood in direct contact with the ground.
   2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated .
      c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.10 lb/cu ft retention.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber in contact with roofing, flashing, or waterproofing.
      c. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

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

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

3.03 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 metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

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

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

E. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches 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.

3.06 TOLERANCES

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

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

3.07 FIELD QUALITY CONTROL

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

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

3.08 CLEANING

A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.

1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

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

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

END OF SECTION

SECTION 06 1500
WOOD DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plywood structural wood decking.

B. Preservative treatment of wood.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AITC 111 - Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection; 2005.

B. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

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

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

C. Shop Drawings: Indicate deck framing system, loads and cambers, bearing details, and framed openings.

D. Designer's Qualification Statement.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with at least three years of documented experience and certified by AITC.

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect glue laminated members in accordance with AITC 111 requirements for unwrapped material.

PART 2 PRODUCTS

2.01 WOOD MATERIALS

A. Plywood Decking: PS 1 veneer plywood; APA Rated Sheathing, Span Rating ____; Exterior grade;1 A interior veneer appearance grade; sanded.

2.02 ACCESSORIES

A. Fasteners and Anchors:
   1. Fastener Type and Finish: Hot-dipped galvanized steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.03 WOOD TREATMENT

A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

B. Preservative Pressure Treatment:
   1. Preservative Pressure Treatment of Plywood Decking: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
      a. Kiln dry plywood after treatment to maximum moisture content of 18 percent.
   2. Marking: Mark each piece with stamp of an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support framing is ready to receive decking.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 INSTALLATION - PLYWOOD DECKING

A. Install decking perpendicular to framing members with ends staggered over firm bearing. On sloped surfaces, lay decking with tongue upward.

B. Engage plywood tongue and groove edges.

C. Allow expansion space at edges and ends.

D. Attach decking with adhesive and screws.

3.04 TOLERANCES

A. Surface Flatness of Decking Without Load: 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

END OF SECTION

SECTION 06 1733
WOOD I-JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood I-joists for roof framing.

B. Bridging, bracing, and anchorage.

C. Framing for openings.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.

1.03 REFERENCE STANDARDS

A. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.

C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.

D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.

B. Protect products from damage due to weather and breakage.

C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.

D. Handle individual joists in the upright position.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wood I-Joists: Solid lumber top and bottom flanges and plywood webs bonded together with structural adhesive, with published span rating to meet project requirements.
   1. Span Rating: Established and monitored in accordance with ASTM D5055 by APA - The Engineered Wood Association.
   2. Plywood: Comply with PS 1.
   3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
   4. Fabrication Tolerances:
      a. Flange Width: Plus/minus 1/32 inch.
      b. Flange Thickness: Minus 1/16 inch.
      c. Joist Depth: Plus 0, minus 1/8 inch.
   5. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.

B. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.

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

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

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 on shop drawings.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

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

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

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Frame openings between joists with lumber in accordance with Section 06 1000.

H. Coordinate installation of sheathing/decking with work of this section.

3.04 TOLERANCES

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

END OF SECTION

SECTION 06 1753
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop-fabricated wood trusses.

B. Truss bridging.

C. Fire-retardant treatment of wood.

D. Preservative treatment of wood.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.

1.03 REFERENCE STANDARDS

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

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

C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2024).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

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

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

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

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.

C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
   1. Include identification of engineering software used for design.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

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

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 PRODUCTS

2.01 TRUSSES

A. Wood Trusses: Design and fabricate trusses in accordance with ANSI/TPI 1 and to achieve specified design requirements indicated.
   1. Connectors: Steel plate.
   2. Structural Design: Comply with applicable code for structural loading criteria.
   3. Fire Retardance: Comply with applicable codes; provide factory pressure-treated wood.
   4. Decay Resistance: Factory preservative-treated wood.

2.02 MATERIALS

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

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

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

2.03 ACCESSORIES

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

B. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 06 1000.

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

D. Bearing Plates: Electrogalvanized steel.

2.04 WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

B. Fire-Retardant Treatment, Exterior Type: AWPA U1, Use Category UCFB, Commodity Specification H, chemically treated and pressure impregnated, maximum flame spread index of 25 when tested in accordance with ASTM E84 and with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898; kiln dried after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood.

C. Fire-Retardant Treatment, Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated, maximum flame spread index of 25 when tested in accordance with ASTM E84 and with no evidence of significant combustion when test is extended for an additional 20 minutes; kiln dried after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood.

D. Preservative Pressure Treatment of Lumber: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
   1. Kiln dry after treatment to maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

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

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

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

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

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

D. Install permanent bridging and bracing.

E. After erection, touch-up primed surfaces with primer consistent with shop coat.

3.04 SITE-APPLIED WOOD TREATMENT

A. Treat all site-sawn cuts of pressure-treated wood using same type of treatment (i.e. preservative or fire-retardant).

B. Apply treatment in accordance with manufacturer's instructions.

3.05 TOLERANCES

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

END OF SECTION

SECTION 06 8316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 5100 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2024.

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; 2024.

E. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials; 2022.

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 Panel (**FRP-1**):
   1. Basis of Design: MDC; www.mdcwall.com
   2. Crane Composites, Inc: www.cranecomposites.com/#sle.
   3. Marlite, Inc: www.marlite.com/#sle.

2.02 PANEL SYSTEMS

A. Wall Panels at kitchen:
   1. Panel Size: _____ feet As indicated on the Drawings.
   2. Panel Thickness: 0.10 inch.
   3. Surface Design: As indicated on the Drawings.
   4. Color: As indicated in Drawing Finish Key, or as selected by Architect from manufacturer's full range.
   5. 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. Class 1 fire rated when tested in accordance with FM 4880.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   4. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

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

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 0553
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 REFERENCE STANDARDS

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

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

1.04 QUALITY ASSURANCE

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

1.05 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. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 PREPARATION

A. See Section 09 9123 for substrate preparation for painted markings.

3.03 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 09 9000.

D. Install neatly, with horizontal edges level.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Self-adhered HDPE sheet membrane.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

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

B. Product Data: Provide data for membrane.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

PART 2 PRODUCTS

2.01 SHEET WATERPROOFING APPLICATIONS

A. Self-Adhered HDPE Sheet Membrane:
   1. Location: Foundation and footing.
   2. Elevator shaft and footing below grade

2.02 SHEET WATERPROOFING MATERIALS

A. Self-Adhered HDPE Sheet Membrane: Recommended by manufacturer for placement below concrete slabs and on outside face of below grade walls before placement of concrete.
   1. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting work.

3.02 PREPARATION

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

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

D. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

E. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

F. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

G. Seal membrane and flashings to adjoining surfaces.

END OF SECTION

SECTION 07 1400
FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cold-applied elastomeric polymer dispersion waterproofing.

1.02 RELATED REQUIREMENTS

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

B. Section 04 2000 - Unit Masonry: Masonry joints prepared to receive flashings.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal parapet covers, copings, and counterflashings.

1.03 ABBREVIATIONS

A. HDPE - High-Density Polyethylene.

B. NRCA - National Roofing Contractors Association.

C. SBS - Styrene-Butadiene-Styrene.

1.04 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).

C. ASTM D1653 - Standard Test Methods for Water Vapor Transmission of Organic Coating Films; 2013 (Reapproved 2021).

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

1.05 SUBMITTALS

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

B. Product Data: Provide data for membrane, surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Warranty Documentation:
   1. Submit manufacturer warranty and ensure that forms have been 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 three years documented experience.

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

1.07 MOCK-UPS

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

B. Construct mock-up consisting of 20 sq ft of horizontal and vertical fluid-applied waterproofing; to represent finished work including internal and external corners, drainage panel, base flashings, control joints, expansion joints, counterflashings, and protective cover.

C. Locate where directed.

D. Mock-up may remain as part of work.

1.08 FIELD CONDITIONS

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

1.09 WARRANTY

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

B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cold-Applied Elastomeric Polymer Dispersion Waterproofing:
   1. Tremco Commercial Sealants & Waterproofing: TREMProof 201/60.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FLUID-APPLIED WATERPROOFING APPLICATIONS

A. Cold-Applied Elastomeric Polymer Dispersion Waterproofing:
   1. Location: Below grade walls, planters, and other areas as noted on drawings.

2.03 FLUID-APPLIED WATERPROOFING MATERIALS

A. Cold-Applied Elastomeric Polymer Dispersion Waterproofing:
   1. Cured Thickness: 60 mils + or - 5 mils, minimum.
   2. Suitable for installation over unit masonry and concrete substrates at waterproofing of window, door and CMU openings.
   3. Tensile Strength: 71 psi, minimum, measured in accordance with ASTM D412.
   4. Ultimate Elongation: 600 percent, minimum, measured in accordance with ASTM D412.
   5. Water Vapor Permeability, Standard: 8.64 perms, maximum, at 30 mil, 0.030 inch dry thickness, measured in accordance with ASTM D1653, Method B.
   6. Water Vapor Permeability, Inverted: 13.23 perms, maximum, at 30 mil, 0.030 inch dry thickness, measured in accordance with ASTM D1653, Method B.

2.04 ACCESSORIES

A. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
   1. Composition: Dimpled polystyrene core; polypropylene or polyester filter fabric.
   2. Thickness: 3/8 inch.
   3. Core Compressive Strength: 15,000 psf, minimum, in accordance with ASTM D1621
   4. Products:
      a. Tremco Commercial Sealants & Waterproofing; TREMDrain: www.tremcosealants.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Cant Strips: Premolded composition material.

C. Counterflashings: As recommended by membrane and protection board manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.

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

3.02 PREPARATION

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

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

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

D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.

E. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.

F. Prepare building expansion joints at locations as indicated on drawings.

G. Install cant strips at inside corners.

3.03 INSTALLATION

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

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

C. At joints and cracks less than 1/2 inch in width including joints between horizontal and vertical surfaces, apply 12 inch wide strip of joint cover sheet.

D. At joints from 1/2 inch to 1 inch in width, loop joint cover sheet down into joint between 1-1/4 inch to 1-3/4 inch, and extend sheet at least 6 inches on either side of expansion joint.

E. Center joint cover sheet over joints, roll sheet into 1/8 inch thick coating of waterproofing material and apply second coat over sheet extending at least 6 inches beyond sheet edges.

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

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

H. Extend waterproofing material and flexible flashing into drain clamp flange, apply adequate coating of liquid membrane to ensure clamp ring seal, and coordinate with drain installation requirements; see plumbing sections for additional requirements.

I. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Immediately after cooling, dust membrane with tack-reducing surfacing at rate of approximately 10 lb/100 sq ft.

B. After membrane has cooled, but before it becomes dusty, apply separation sheet and lap joints to ensure complete coverage.

C. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward, and scribe and cut boards around projections, penetrations, and interruptions.

D. Place protection board directly against drainage panel; butt joints, and scribe and cut boards around projections, penetrations, and interruptions.

3.05 FIELD QUALITY CONTROL

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

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

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, underside of floor slabs, over roof deck, over roof sheathing, and exterior wall behind EIFS 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 07 2700 - Air Barriers: Separate air barrier materials.

B. Section 07 5400 - Thermoplastic Membrane Roofing: Installation requirements for board insulation over low slope roof deck.

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 D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

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

1.04 SUBMITTALS

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

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

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

G. 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 Under Concrete Slabs: Extruded polystyrene (XPS) board.

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

C. Insulation Inside Prefabricated Wall Panels: Extruded polystyrene (XPS) board.

D. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

E. Insulation Over Roof Deck: Polyisocyanurate board.

2.02 FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.

B. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.

C. Rigid Cellular Polyisocyanurate (ISO) Thermal Insulation Board with Facers Both Sides and Providing Interior Finish System: Complying with ASTM C1289.
   1. Compressive Strength: 16 psi, minimum.
   2. Thermal Resistance, R-value: Type I, Class 2, at 1-1/2 inch thick; 9.0, minimum, at 75 degrees F.
   3. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   4. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   5. Board Size: 48 inch by 96 inch.
   6. Board Thickness: 1 inch.
   7. Board Edges: Square.
   8. Exposed Facer: 4 mil, 0.004 inch embossed white thermoset-coated aluminum.
   9. Non-Exposed Facer: 1.25 mil, 0.00125 inch embossed aluminum.

D. Polyisocyanurate (ISO) Cover Board Insulation: Rigid high-density polyisocyanurate cover board; comply with ASTM C1289.
   1. Type II ISO Cover Layer, Compressive Strength: 80 psi (551 kPa).
   2. Glass facers on both major surfaces.
   3. Board Thickness: 1/2 inch.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Formaldehyde Content: Zero.

5. Thermal Resistance: R-value of 19.
6. Thickness: 5.5 inch.
7. Products:
    a. CertainTeed Corporation: www.certainteed.com/#sle.
    b. Johns Manville: www.jm.com/#sle.
    c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.owenscorning.com/en-us/#sle.
    d. Substitutions: See Section 01 6000 - 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: 450 or less, when tested in accordance with ASTM E84.
3. Thermal Resistance: R-value of 19.
4. Thickness: 5.5 inch.
5. Products:
    a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: Black polyethylene film for above grade application, 10 mil, 0.010 inch thick.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
1. Application: Sealing of interior circular penetrations, such as pipes or cables.
2. Width: Are required for application.
3. Temperature Resistance: Range of minus 40 to 212 degrees F.

C. Self-Adhered Transition Flashing: Multipurpose, self-adhered flashing with modified butyl adhesive, polyester fiber top sheet, and polypropylene interlayer.
1. Application: Primerless adhesion for use as through-wall flashings and wall transitions to roof and below-grade systems.
2. Thickness: 45 mil, 0.045 inch, nominal.
3. Size: 6 inches wide, in rolls 75 feet long.
4. Tensile Strength: Greater than 1,300 psi complying with ASTM D412 test method.

D. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

E. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

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

G. Wire Mesh: Galvanized steel, hexagonal wire mesh.

H. 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 and adhesive.

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.

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

3.03 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

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

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.04 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. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
   3. Do not apply more insulation than can be covered with roofing on the same day.

3.05 BATT INSTALLATION

A. Install insulation 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. Staple or nail facing flanges in place at maximum 6 inches on center.

F. Coordinate work of this section with construction of air barrier seal, see Section 07 2700.

3.06 FIELD QUALITY CONTROL

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

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

3.07 PROTECTION

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

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 2 PRODUCTS

1.01 WATER-RESISTIVE BARRIERS

A. Water-Resistive and Air Barrier, Multilayers: Outer layers of nonwoven, spunbonded polypropylene with vapor permeable, watertight polymeric middle layer.
   1. Air Permeance: 0.0011 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 28 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
   3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 3 months of weather exposure.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
   5. Seam and Perimeter Tape: As recommended by sheet manufacturer.
   6. Products:
      a. National Shelter Products, Inc; DRYline HPX Commercial: www.nationalshelter.com/#sle.
      b. SIGA Cover Inc; SIGA-Majvest 200: www.siga.swiss/global_en/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

1.02 ACCESSORIES

A. Seal and Perimeter Tapes: As recommended by water-resistive barrier manufacturer.

B. Flashings and Sealants: As recommended by water-resistive barrier manufacturer for application.

C. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and weather barrier materials.
   1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch nominal thickness.
   2. Color: Green.

D. Flexible Flashing: Self-adhering or mechanically attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.

E. Threshold Flashing: Closed-cell foam tape with rubberized adhesive membrane; seals subfloor under threshold.
   1. Width: 5-1/2 inches.
   2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

2.02 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Install continuous water-resistive barriers where indicated on drawings, with sheets lapped to shed water.

C. Apply sealants within recommended temperature range in accordance with manufacturer's installation instructions.

D. Mechanically Fastened Sheets:
   1. Install sheets in shingle fashion to shed water; align horizontally.
   2. Overlap seams as recommended by manufacturer, 6 inches, minimum.

3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
4. Install water-resistive barrier over jamb flashings.
5. Install head flashings under water-resistive barrier.
6. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.

END OF SECTION

SECTION 07 4213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 06 1000 - Rough Carpentry: Wall panel substrate.

C. Section 07 2100 - Thermal Insulation.

D. Section 07 2700 - Air Barriers: Air barrier under wall panels.

E. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

F. Section 09 2116 - Gypsum Board Assemblies: Wall panel substrate.

1.03 REFERENCE STANDARDS

A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

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

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

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

C. Samples: Submit two samples of wall panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.

D. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.05 QUALITY ASSURANCE

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

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

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

1.06 MOCK-UPS

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

B. Construct mock-up, 4 feet long by 4 feet wide; include panel system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, and related insulation in mock-up.

1.07 WARRANTY

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

B. Finish Warranty: Provide 15-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of metal wall panels. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Soffit Panels:
   1. ATAS International, Inc; Rigidwall II, Model No. MFN163: www.atas.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   2. Design Pressure: In accordance with applicable codes.
   3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   7. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.

B. Soffit Panels:
   1. Profile: Style as indicated, with venting provided.
   2. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
   3. Color: As selected by Architect from manufacturer's standard line.

C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

D. Expansion Joints: Same material, thickness and finish as exterior sheets; manufacturer's standard brake formed type, of profile to suit system.

E. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

F. Anchors: Galvanized steel.

2.03 MATERIALS

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

2.04 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film

thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.

1. Products:
    a. Arkema, Inc; Kynar 500: www.arkema.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 9200

C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.

1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

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

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane, and spaced at intervals indicated.

B. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.03 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Lap panel ends 2 inches, minimum.

F. Provide expansion and control joints where indicated.

G. Use concealed fasteners unless otherwise indicated by Architect.

H. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.05 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Remove site cuttings from finish surfaces.

C. Remove protective material from wall panel surfaces.

D. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 5423
THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING - CARLISLE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered system with thermoplastic polyolefin (TPO) roofing membrane.

B. Insulation, flat and tapered.

C. Vapor retarder.

D. Deck sheathing.

1.02 REFERENCE STANDARDS

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

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

C. ASTM D4263 - Standard Practice for Indicating Moisture in Concrete by the Plastic Sheet Method; 2024.

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

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

F. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2025).

G. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; 2016, with Editorial Revision (2022).

H. NRCA (RM) - The NRCA Roofing Manual; 2025.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty (20) years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section:
   1. Approved by membrane manufacturer.
   2. Extend manufacturer's labor and materials guarantee.

1.04 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather. Refer to manufacturer's written instructions.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above ____ degrees F.

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

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

E. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.

F. Do not allow grease, oil, fats, or other contaminants to come into direct contact with membrane.

1.05 WARRANTY

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

B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within 25 years after installation.

C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 25 years.
   2. For repair and replacement include costs of both material and labor in warranty.
   3. Include accidental punctures according to the manufacturer's standard warranty terms.
   4. Include hail damage according to the manufacturer's standard warranty terms.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Carlisle SynTec Systems: www.carlisle-syntec.com/#sle.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOFING APPLICATIONS

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

B. Roofing Assembly Performance Requirements and Design Criteria:
   1. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980.
      a. Field applied coating may not be used to achieve specified SRI.
   2. Wind Uplift:
      a. Designed to withstand wind uplift forces calculated with ASCE 7.
      b. Design Wind Speed: In accordance with local building code and authorities having jurisdiction (AHJ).
   3. Insulation Thermal Resistance (R-Value): Provide R-Value over entire roof deck in accordance with local building code requirements.
   4. Drainage: No standing water within 48 hours after precipitation.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Single Source Responsibility: Provide and install products from single source.

B. Vapor Barrier/Base Sheet: Self-adhering, rubberized asphalt membrane laminated to spun-bonded polyester fabric; 40 mil, 0.040 inch thick, minimum.

C. Membrane:
   1. Material: Thermoplastic Polyolefin (TPO) complying with ASTM D6878/D6878M.
   2. Reinforcing: Non-woven fleece backing.
   3. Thickness: 80 mil (0.080 inch), minimum plus fleece backing thickness for 135 mils overall.
   4. Sheet Width: Factory fabricated into largest sheets possible.
   5. Color: White.
   6. Products:
      a. Carlisle Sure-Weld FleeceBACK TPO.

D. Seaming Materials: As recommended by membrane manufacturer.

E. Membrane Fasteners: As recommended and approved by membrane manufacturer.
   1. Base Sheet Fasteners and Plates:

F. Flexible Flashing Material: Same material as membrane.

G. Base Flashing: Provide waterproof, fully adhered base flashing system at all penetrations, plane transitions, and terminations.

2.04 DECK SHEATHING AND COVER BOARDS

A. Cover Board: Polyisocyanurate (ISO) thermal board, complying with ASTM C1289; Type II - Faced with coated-glass facer on both major surfaces of core foam, Class 4 with thickness of 1/2 inch, and Grade 1 with 109 psi, maximum, compressive strength.

2.05 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Complies with ASTM C1289, Type II, Class 2 - Faced with dark coated-glass facer on one side and light coated-glass facer on other surface of core foam.
   1. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
   2. Grade and Compressive Strength: Grade 2, 20 psi, minimum.
   3. Board Thickness: 2 inches.
   4. Product: Carlisle SecurShield.

2.06 ACCESSORIES

A. Prefabricated Flashing Accessories:
   1. Corners and Seams: Same material as membrane, in manufacturer's standard thicknesses.
   2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.
   3. Sealant Pockets: Same material as membrane, with manufacturer's standard accessories, in manufacturer's standard configuration.
   4. Pressure Sensitive Cover Strips: 6 inches wide, 45 mil, 0.045 inch thick, non-reinforced TPO membrane laminated to 35 mil, 0.035 inch thick cured synthetic rubber with pressure sensitive adhesive.
   5. Miscellaneous Flashing: Non-reinforced TPO membrane; 80 mil, 0.080 inch thick, in manufacturer's standard lengths and widths.

B. Insulation Adhesive: Two-component polyurethane, expanding foam.
   1. Products:

C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

D. Membrane Adhesive: As recommended by membrane manufacturer.
   1. Product:

E. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

F. Sealants: As recommended by membrane manufacturer.
   1. Product:

G. Cleaner: Manufacturer's standard, clear, solvent-based cleaner.
   1. Product: Carlisle Weathered Membrane Cleaner.

H. Edgings and Terminations: Manufacturer's standard edge and termination accessories.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION, GENERAL

A. Clean substrate thoroughly prior to roof application.

3.03 WOOD DECK PREPARATION

A. Verify flatness and tightness of joints of wood decking. Verify that all wood decking edges are fully supported. Fill knot holes with latex filler or completely cover with securely nailed sheet metal.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

3.04 CONCRETE DECK PREPARATION

A. Verify adjacent precast concrete roof members do not vary more than 1/4 inch in height. Verify grout keys are filled flush.

B. Fill surface honeycomb and variations with latex filler.

C. Confirm dry deck by moisture meter with 12 percent moisture maximum when tested per ASTM D4263.

3.05 INSTALLATION - GENERAL

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

B. Do not apply roofing membrane during unsuitable weather.

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

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

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

3.06 INSULATION APPLICATION

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

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Attachment of Insulation:
   1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
   2. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.

D. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

F. Lay boards with edges in moderate contact without forcing, and gap between boards no greater than 1/4 inch. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

G. Do not apply more insulation than can be completely waterproofed in the same day.

3.07 MEMBRANE APPLICATION

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

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

C. Fully Adhered Application: Apply adhesive at manufacturer's recommended rate. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Seam Welding:
   1. Seam Welding: Overlap edges and ends and seal seams by heat welding, minimum 2 inches.
   2. Cover seams with manufacturer's recommended joint covers.

3. Probe seams once welds have thoroughly cooled, in approximately 30 minutes.
4. Repair deficient seams within the same day.
5. Seal cut edges of reinforced membrane after seam probe is complete.

E. At intersections with vertical surfaces:
1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
2. Fully adhere flexible flashing over membrane and up to nailing strips.

F. Coordinate installation of roof drains and sumps and related flashings. Locate all field splices away from low areas and roof drains. Lap upslope sheet over downslope sheet.

G. Daily Seal: Install daily seal per manufacturers instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.08 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

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; 2023.

B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

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

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

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

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

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.06 QUALITY ASSURANCE

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

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

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim:
   1. Hickman Edge Systems; _____: www.hickmanedgesystems.com/#sle.
   2. Petersen Aluminum Corporation; _____: www.pac-clad.com/#sle.
   3. Tamlyn: www.tamlyn.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

B. Stainless Steel: ASTM A666/A666M, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 - Brushed finish.

2.03 PREPAINTED, METALLIC-COATED STEEL SHEETS

A. Comply with ASTM A755/A755M.

B. Metallic-Coated Steel Sheet Substrates:

C. Substrate Preparation for Prefinishing: Clean and prepare substrate surfaces in accordance with coating manufacturer's recommendations for substrate type and application.

D. Washcoats or Backercoats: Provide washcoats or backercoats in accordance with organic coating manufacturer's recommendations.

E. Primer Coats: Provide basecoat primers in accordance with coating manufacturer's recommendations for substrate type, topcoat, and application.

2.04 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.05 GUTTERS AND DOWNSPOUTS

A. See Section 07 7123 for manufactured gutters and downspouts.

B. Gutters: Profile as indicated.

C. Downspouts: Profile as indicated.

D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Downspout Supports: Straps.

E. Seal metal joints.

2.06 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. Fenestration Perimeter Flashing Attachments: Two-piece flashing receiver and clip of extruded aluminum, at least 0.045 inch thick, for attaching flashing at perimeter of exterior wall fenestration openings.
   1. Provide flashing receiver profile appropriate for flashing applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Exterior Flashing Receivers: Install in accordance with manufacturer's recommendations, and in proper relationship with adjacent construction, and as follows:

E. Seal metal joints watertight.

F. Secure gutters and downspouts in place with concealed fasteners.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for field inspection requirements.

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

END OF SECTION

SECTION 07 7100
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, and gravel stops.

B. Roof control and expansion joint covers.

1.02 RELATED REQUIREMENTS

A. Section 07 7200 - Roof Accessories: Manufactured curbs, roof hatches, and snow guards.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.

D. NRCA (RM) - The NRCA Roofing Manual; 2025.

1.04 SUBMITTALS

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

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two appropriately sized samples of coping.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. ATAS International, Inc; Rapid-Lok Fascia: www.atas.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Control and Expansion Joint Covers:
   1. Construction Specialties, Inc; Roof, wall, ceiling and floor covers: www.c-sgroup.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

C. Counterflashings:

2.02 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
   1. Configuration: Fascia, cant, and edge securement for roof membrane.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
   3. Exposed Face Height: As indicated on drawings.

B. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
   1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.

2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Wall Width: As indicated on drawings.
4. Outside Face Height: As indicated on drawings.
5. Material: Formed steel sheet, galvanized, 24 gauge, 0.024 inch thick, minimum.
6. Finish: 70 percent polyvinylidene fluoride.
7. Color: to be selected by Architect.

C. Engineered Roof Perimeter Blocking: Prefabricated 20-gauge, 0.036-inch galvanized steel retainer for lightweight concrete; with cleat to accept copings; attach to roof deck in lieu of wood blocking at roof edge; for low slope roof installations.

D. Counterflashings: Factory fabricated and finished sheet metal that overlaps top edges of base flashing by at least 4 inches, and designed to snap into through-wall flashing or reglets with lapped joints.

E. Pipe Penetration Wall Seal: Seal for HVAC piping wall penetrations with wall-mounted rigid plastic outlet cover and elastomeric wall seal gasket.
1. Outlet Cover Color: Gray.

2.03 FINISHES

A. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mil, 0.0007 inch thick.

B. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors.

2.04 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

C. Insulation Board Adhesive: Two-component, low-rise polyurethane foam adhesive used for adhering insulation to low slope roof deck materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

F. Coordinate installation of flashing flanges into reglets.

END OF SECTION

SECTION 07 7123
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished galvanized steel gutters and downspouts.

B. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Downspout boots.

B. Section 07 6200 - Sheet Metal Flashing and Trim.

C. Section 09 9113 - Exterior Painting: Field painting of metal surfaces.

1.03 REFERENCE STANDARDS

A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

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

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

1.04 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Comply with applicable code for size and method of rain water discharge.

C. Maintain one copy of each document on site.

1.05 SUBMITTALS

A. See Section 01 3000 - 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.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - 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 could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. ATAS International, Inc; ____: www.atas.com/#sle.
   2. Hickman Edge Systems; Wind Resistant Gutter: www.hickmanedgesystems.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Scupper and Collectors:
   1. ATAS International, Inc; ____: www.atas.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
   1. Finish: Shop pre-coated with modified silicone coating.

2. Color: As selected by Architect from manufacturer's standard colors.

2.03 COMPONENTS

A. Gutters: Profile as indicated.

B. Downspouts: Profile as indicated.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: Type recommended by fabricator.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

D. Fasteners: Galvanized steel, with soft neoprene washers.

2.04 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.05 ACCESSORIES

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Finish: Manufacturer's standard factory applied powder coat finish.
   4. Color: To be selected by Architect from manufacturer's standard range.
   5. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.
   6. Products:
      a. Downspoutboots.com, a division of J. R. Hoe & Sons; ____: www.downspoutboots.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed sheet metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Slope gutters 1/4" inch per foot .

D. Connect downspouts to storm sewer system. Grout connection watertight.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Roof penetrations mounting curbs.

C. Roof hatches.

D. Roof snow and ice melting system.

1.02 RELATED REQUIREMENTS

A. Section 07 7100 - Roof Specialties: Other manufactured roof specialty items.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; Current Edition.

B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.

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

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

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

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

H. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

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

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.
   5. For smoke hatches, submit evidence of approval by evaluation agency specified.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

D. Certificate: For smoke hatches, provide certificate of approval from authority having jurisdiction.

E. 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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

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

C. Store products under cover and elevated above grade.

1.06 WARRANTY

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

B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

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. Sheet Metal Material:
      a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
         1) Color: As selected by Architect from manufacturer's standard line of colors.
   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.
   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 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 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. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   3. Height Above Roof Deck: 14 inches, minimum.

C. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.

2.02 ROOF HATCHES AND VENTS

A. Roof Hatch Manufacturers:
   1. Babcock-Davis; Personnel: www.babcockdavis.com/#sle.
   2. Bilco Company; Type TB (various types and special size): www.bilco.com/#sle.
   3. Dur-Red Products; _____: www.dur-red.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.

1. Style: Provide flat metal covers unless otherwise indicated.
2. Mounting Substrate: Provide frames and curbs suitable for mounting on flat roof deck sheathing with insulation.
3. Thermally Broken Hatches: Provide insulation within frame and cover.
4. For Ladder Access: Single leaf; 30 by 36 inches.

C. Metal Covers: Flush, insulated, hollow metal construction.
1. Capable of supporting 40 psf live load.
2. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
3. Gasket: Neoprene, continuous around cover perimeter.

D. Hardware: Type 316 stainless steel, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

2.03 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
1. Design Loadings and Configurations: As required by applicable codes.
2. Height: Provide minimum clearance of 12 inches under supported items to top of roofing.
3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

B. Safety Railing System: Roof hatch safety rail system mounted directly to curb without penetration of roofing system.
1. Railing Size: As indicated on drawings.
2. Railing: Comply with 29 CFR 1910.23 for ladder safety, with safety factor of two.
3. Self-Closing Gate: Comply with 29 CFR 1910.29 for safe egress and fall protection through hatch opening.
4. Posts and Rails: Galvanized steel tubing.
5. Gate: Same material as railing; automatic closing with latch.
6. Finish: Manufacturer's standard, factory-applied.
7. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
8. Mounting Brackets: Hot-dip galvanized steel, 1/4 inch thick, minimum.
9. Products:
    a. Babcock-Davis; Safety Railings: www.babcockdavis.com/#sle.
    b. BILCO Company; Bil-Guard 2.0: www.bilco.com/#sle.
    c. Substitutions: See Section 01 6000 - Product Requirements.

C. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.

D. Duct Supports: Provide extruded aluminum supports and sized in accordance with diameter of supported ducts, and with base that is non-penetrating of roofing membrane.

2.04 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: low slope roof system with gutters, scuppers and downspouts..
2. Provide cable spacing and number of heating circuits and accessories in accordance with manufacturer's written requirements.
3. Cable: Nickel-plated copper bus wires with radiation cross-linked polyolefin heating core and primary dielectric insulation, copper metallic braid, and polyolefin outer cover.
4. Supply Voltage: 110-120 VAC with ground-fault protection as required by authorities having jurisdiction (AHJ).
5. Power Output: 12 W/linear ft, nominal, of cable length in snow and ice at 32 degrees F.

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

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

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

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 7000 - Execution and Closeout Requirements: Cutting and patching.

C. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

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

D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2024.

E. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus; 2025.

F. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2024.

G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a.

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

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

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

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

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

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

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

1.04 SUBMITTALS

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

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

C. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.

D. Manufacturer's qualification statement.

E. 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.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

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

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
   2. Hilti, Inc: www.us.hilti.com/#sle.
   3. Passive Fire Protection Partners; Firestop 3600EX: www.firestop.com/#sle.
   4. Specified Technologies Inc: www.stifirestop.com/#sle.
   5. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: www.tremcosealants.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

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.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

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

B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.

C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.

2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: 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 Owner's Independent Testing Agency.

C. Do not cover installed firestopping until inspected by authorities having jurisdiction.

3.04 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Spray-applied joint sealants.

B. Nonsag gunnable joint sealants.

C. Self-leveling pourable joint sealants.

D. Joint backings and accessories.

E. Owner-provided field quality control.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

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

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

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

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

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

F. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2022.

G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

I. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.04 SUBMITTALS

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

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

C. 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. Sustainable Design Documentation: For sealants and primers, submit VOC content and emissions documentation; see Section 01 6116.

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

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

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

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

K. 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.

L. Manufacturer's qualification statement.

M. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

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

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. 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. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches 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 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with expansion joint cover assemblies.
      c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
      d. Joints where sealant installation is specified in other sections.
      e. Joints between suspended ceilings and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
   1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
   2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
   3. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
   4. Wiring Slots in Concrete Paving: Self-leveling epoxy sealant.

C. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 01 6116.

2.04 SPRAY-APPLIED JOINT SEALANTS

A. Spray-Applied Water-Based Acrylic Latex Sealant: For interior applications, spray-applied, fast-drying, premixed acrylic latex sealant, intended for air sealing penetrations and joints.
   1. Surface Burning Characteristics: Smoke developed index of 450 or less, and flame spread index of 25 or less, Class A, when tested in accordance with ASTM E84.
   2. Spray Equipment: Use rate of application and methods as recommended by manufacturer.
   3. Products:
      a. CertainTeed Corporation; CertaSeal INT: www.certainteed.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 NONSAG JOINT SEALANTS

A. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Color: To be selected by Architect from manufacturer's standard range.
   3. Cure Type: Mildew-resistant acetoxy-curing.
   4. Products:
      a. Dow; DOWSIL 758 Silicone Weather Barrier Sealant: www.dow.com/#sle.
      b. Pecora Corporation; Pecora 860: www.pecora.com/#sle.
      c. Pecora Corporation; Pecora 890FTS (Field Tintable Smooth): www.pecora.com/#sle.
      d. Sika Corporation; Sikasil GP: usa.sika.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Products:
      a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
      b. Sika Corporation; Sikasil GP: usa.sika.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.
   1. Adheres to wet surfaces.
   2. Color: White.
   3. Products:
      a. Adfast USA Inc; ADSEAL DWSP 1940 Series: www.adfastcorp.com/#sle.
      b. SIGA Cover Inc; SIGA-Meltell: www.siga.swiss/global_en/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

D. Hybrid Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Color: To be selected by Architect from manufacturer's standard range.
   3. Products:
      a. Tremco Commercial Sealants and Waterproofing; Dymonic FC: www.tremcosealants.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

E. Tamper-Resistant, Silyl-Terminated Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum
   2. Hardness Range: 25 to 30, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Products:
      a. Pecora Corporation; DynaTrol I-XL Hybrid: www.pecora.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

F. Hybrid Silane Polyether Sealant: ASTM C920, Grade NS, Uses NT, M, G, A, and O; single component; not expected to withstand continuous water immersion.
   1. Movement Capability: Plus and minus 35 percent.
   2. Color: To be selected by Architect from manufacturer's standard range.
   3. Products:
      a. CTS Cement Manufacturing Corporation; Rapid Set Non-Sag Sealant and Adhesive - Multi-Purpose Hybrid Silane Polyether: www.CTScement.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

G. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
   1. Movement Capability: Plus and minus 35 percent, minimum.
   2. Color: To be selected by Architect from manufacturer's standard range.
   3. Products:
      a. Sika Corporation; Sikaflex-1A: usa.sika.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

H. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Hardness Range: 20 to 30, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.

I. Non-Curing Butyl Sealant: Solvent-based, single component, non-sag, non-skinning, non-hardening, non-bleeding; non-vapor-permeable; intended for fully concealed applications.
   1. Products:
      a. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: www.pecora.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
   1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.

B. Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M, and O; multi-component; explicitly approved by manufacturer for horizontal expansion joints.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Products:
      a. Pecora Corporation; Urexpan NR-200: www.pecora.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. 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: Concrete gray.
   4. Joint Width, Minimum: 1/8 inch.
   5. Products:
      a. Euclid Chemical Company; EUCO 700: www.euclidchemical.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

D. Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
   1. Durometer Hardness, Type A: 75, minimum, after seven days when tested in accordance with ASTM D2240.
   2. Color: Concrete gray.
   3. Joint Width, Minimum: 1/8 inch.
   4. Joint Width, Maximum: 1/2 inch.
   5. Products:
      a. Euclid Chemical Company; EUCO QWIKjoint UVR: www.euclidchemical.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.07 ACCESSORIES

A. Overlay Extrusion for Glazing System Joint Protection: Rubber profiled extrusions placed over joints in glazing system and provided with watertight seal.
   1. Profile: As required to match existing metal glazing cap requirements.
   2. Color: As required to match existing conditions.
   3. Products:
      a. Tremco Commercial Sealants & Waterproofing; Spectrem Restoration Overlay: www.tremcosealants.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Preformed Extruded Silicone Joint Seal: Pre-cured low-modulus silicone extrusion, in sizes to fit applications indicated on drawings, combined with a neutral-curing liquid silicone sealant for bonding joint seal to substrates.
   1. Size: 1 inch wide, in rolls 100 feet long.
   2. Thickness: 0.78 inch, with ridges along outside bottom edges for bonding area.
   3. Color: As selected by Architect..
   4. Products:
      a. Tremco Commercial Sealants & Waterproofing; Spectrem Simple Seal: www.tremcosealants.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Preformed Extruded Polyurethane Joint Seal: Medium-modulus, preformed polyurethane extrusion used to bridge joints under elastomeric wall coatings, in sizes to fit applications indicated on drawings, combined with polyurethane sealant for bonding joint seal to substrates.
   1. Size: 1-1/2 inch wide, in rolls 100 feet long.
   2. Thickness: 0.051 inch, with ridges along outside bottom edges for bonding area.
   3. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

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

E. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

F. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

G. 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.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
   3. Record each test on Preinstallation Adhesion Test Log as indicated.
   4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

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

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

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

B. Owner will employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

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

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Sound-rated hollow metal doors and frames.

F. Hollow metal borrowed lites glazing frames.

G. Accessories, including glazing, louvers, and matching panels.

1.02 RELATED REQUIREMENTS

A. Section 08 3473 - Sound Control Door Assemblies.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

D. Section 09 9113 - Exterior Painting: Field painting.

E. Section 09 9123 - Interior Painting: Field 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. SDI: Steel Door Institute.

E. 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; 2024.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.

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

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; 2024.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

J. ASTM E413 - Classification for Rating Sound Insulation; 2022.

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.

S. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

T. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

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

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

1.05 SUBMITTALS

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

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

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.

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

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

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

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

C. 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 Doors and Frames:
   1. Dormakaba USA:
   2. Mesker, dormakaba Group; FDJ Series Drywall Frames: www.meskeropeningsgroup.com/#sle.

3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
5. Amweld.
6. Commercial Door and Hardware
7. Security Metal Products Corporation
8. Deansteel

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. Refer to Door Schedule for additional information.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
      a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. 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 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Polystyrene, 1 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 6.0 minimum, for installed thickness of polystyrene.
   4. Door Thickness: 1-3/4 inches, nominal.

C. Interior Doors, Non-Fire-Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 3 - Extra Heavy-duty.
    b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
    e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
2. Door Core Material: resin impregnated Kraft honeycomb core completely filling the inside of the door and laminated to the inside faces of the panels.
3. Door Thickness: 1-3/4 inches, nominal.

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

E. Sound-Rated Interior Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 2 - Heavy-duty.
    b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
2. Sound Transmission Class (STC) Rating of Door and Frame Assembly: STC of 45, minimum, calculated in accordance with ASTM E413, and tested in accordance with ASTM E90.
3. Door Thickness: As required to meet acoustic requirements indicated.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Full profile/continuously welded type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
3. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

E. Door Frames, Fire-Rated: Full profile/continuously welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

F. Sound-Rated Door Frames: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

G. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

H. Mullions for Pairs of Doors: per hardware schedule, with profile similar to jambs.

I. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

J. Transom Bars: Fixed, of profile same as jamb and head.

K. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

L. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

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

2.06 ACCESSORIES

A. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.

B. Glazing: As specified in Section 08 8000, factory installed.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Astragals and Edges for Double Doors: Pairs of door astragals, and door edge sealing and protection devices.
   1. UL listed products in compliance with requirements of authorities having jurisdiction.
   2. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
   3. Astragal Type: Split, two parts, and with automatic locking, cutouts for other door hardware, and sealing gasket.
   4. Edge Type: Beveled edge
   5. Material: 12 ga Steel.
   6. Provide non-corroding fasteners at exterior locations.

E. 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.

F. 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

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 prefinished frames after painting and wall finishes are complete.

C. Install fire rated units in accordance with NFPA 80.

D. Coordinate frame anchor placement with wall construction.

E. Install door hardware as specified in Section 08 7100.

F. Comply with glazing installation requirements of Section 08 8000.

G. Coordinate installation of electrical connections to electrical hardware items.

H. 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 measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

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

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

D. ASTM E413 - Classification for Rating Sound Insulation; 2022.

E. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2023.

F. AWI (QCP) - Quality Certification Program; Current Edition.

G. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

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

I. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

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

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

L. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.04 SUBMITTALS

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

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of door veneer, 3 by 3 inches in size illustrating wood grain, stain color, and sheen.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

F. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

G. Manufacturer's Installation Instructions: Indicate special installation instructions.

H. Manufacturer's qualification statement.

I. Specimen warranty.

J. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

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

C. Woodwork Quality Assurance Program:
   1. Comply with AWI (QCP) woodwork association quality assurance service/program in accordance with requirements for work specified in this section; www.awiqcp.org/#sle.
   2. Provide labels indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   3. Provide designated labels on shop drawings as required by quality assurance program.
   4. Provide designated labels on installed products as required by quality assurance program.
   5. 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 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Haley Brothers: www.haleybros.com/#sle.
   2. Krieger Specialty Products: www.kriegerproducts.com/#sle.
   3. Forte Opening Solutions; Aspiro Select Wood Veneer Doors: www.forteopenings.com/#sle.
   4. Oregon Door; _____: www.oregondoor.com/#sle.
   5. VT Industries, Inc: www.vtindustries.com/#sle.
   6. Eggers Industries
   7. Marshalfield Door System
   8. Lambton Doors
   9. Graham Mfg. Co.
   10. Algoma.
   11. Substitutions: See Section 01 6000 - Product Requirements.

B. Sound-Rated Wood Doors:
   1. Forte Opening Solutions; Acoustically-Rated Door Solutions: www.forteopenings.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

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) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.
2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
3. Sound-Rated Doors: Minimum STC of 45, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
4. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

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

B. 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.

C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White oak, 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; unless otherwise indicated.
   1. Vertical Edges: Same species as face veneer.
   2. "Running Match" each pair of doors and doors in close proximity to each other.
   3. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

B. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

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.

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:

B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
   1. Transparent:
      a. System - TR-6, Catalyzed Polyurethane.
      b. Stain: As selected by Architect.
      c. Sheen: Semigloss.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 1113.

B. Metal Louvers:
   1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.

C. Glazed Openings:

1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
2. Fire-Protection-Rated Glass: Safety Certification, 16 CFR 1201, Category II.
3. Glazing: Single vision units, 1/4 inch thick glass.
4. Tint: Clear.

D. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
   2. Metal Finish: color selected by Architect polyester powder coating.
   3. Glazing: 1/4 inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

E. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

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 and UL (DIR) requirements.
   2. 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. Coordinate installation of glazing.

F. 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.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Mortise cylinder and core hardware.

1.03 SUBMITTALS

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

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Manufacturer's Installation Instructions: Indicate installation requirements.

D. Installer's qualification statement.

E. Project Record Documents: Record actual locations of each access unit.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

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

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Location: As indicated on drawingsand as is necessary to access controls and maintenance items that would otherwise be inaccessible for service.
   2. Panel Material: Aluminum extrusions with gypsum board inlay.
   3. Size: 12 by 12 inches.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   6. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Fire-Rated Wall-Mounted Units:
   1. Location: As indicated on drawings.
   2. Wall Fire-Rating: As indicated on drawings.
   3. Panel Material: Steel.
   4. Size: 12 by 12 inches.
   5. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

C. Ceiling-Mounted Units:
   1. Location: As indicated on drawingsand as is necessary to access controls and maintenance items that would otherwise be inaccessible for service.
   2. Panel Material: Steel.
   3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   4. Size - Other Ceilings: 12 by 12 inches.
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

D. Fire-Rated Ceiling-Mounted Units:

1. Location: As indicated on drawingsand as is necessary to access controls and maintenance items that would otherwise be inaccessible for service.
2. Ceiling Fire-Rating: As indicated on drawings.
3. Panel Material: Steel.
4. Size: 12 by 12 inches.
5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:
1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

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

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 3313
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Rough openings.

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

C. Section 09 2116 - Gypsum Board Assemblies: Rough openings.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - 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. Manufacturer's Installation Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

D. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

1.05 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Doors:
   1. Alpine Overhead Doors, Inc: www.alpinedoors.com/#sle.
   2. C.H.I. Overhead Doors; Model 6522 (steel): www.chiohd.com/#sle.
   3. Cornell Cookson.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Metal Doors, Non-Fire-Rated: Aluminum slat curtain.
   1. Mounting: Interior face mounted.
   2. Nominal Slat Size: 1-1/4 inches wide.
   3. Slat Profile: Flat.
   4. Finish, Aluminum: Anodized.
   5. Color: As selected by Architect from manufacturer's standard range.
   6. Guides: Formed track; same material and finish unless otherwise indicated.
   7. Hood Enclosure: Manufacturer's standard; primed steel.
   8. Manual hand chain lift operation.
   9. Locking Devices: Slide bolt on inside.

2.03 COMPONENTS

A. Metal Curtain Construction: Interlocking, single-thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position; neoprene astragal along bottom edge.

3. Aluminum Slats: ASTM B221 (ASTM B221M), aluminum alloy Type 6063; minimum thickness 0.05 inch.

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
   1. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.

C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

D. Lock Hardware:
   1. Slide Bolt: Provide on both-jamb sides, extending into slot in guides, _____.

E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

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.

E. Install perimeter trim as indicated.

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

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Steel attachment devices.

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

C. Section 08 8000 - Glazing: Glass and glazing accessories.

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; 2024.

D. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

E. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

F. 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).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

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

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, opening configuration, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 6"x6" inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

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

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Designer's qualification statement.

J. Manufacturer's qualification statement.

K. Installer's qualification statement.

1.06 QUALITY ASSURANCE

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

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three (3) years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three (3) years of documented experience and approved by manufacturer.
   1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.

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. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts Manufacturers:
   1. Arcadia, Inc: www.arcadiainc.com/#sle.
   2. Kawneer North America: www.kawneer.com/#sle.
   3. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Front-Set Style, Thermally-Broken:
   1. Basis of Design: Arcadia, Inc: TC 670 Series.
   2. Basis of Design: Arcadia, Inc: TC 470 Series.
   3. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Arcadia, Inc: WS 512 and WS 512+.
   2. Thickness: 1-3/4 inches.

B. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.
   2.

2.04 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 insulating glazing.
   2. Finish Color: As selected by Architect from manufacturer's standard line.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.

B. Glazing: See Section 08 8000.

C. Infill Panels: Insulated, aluminum, with edges formed to fit glazing channel and sealed.
   1. Total Nominal Thickness: 1 inch.
   2. Core: Polyisocyanurate insulation core with R-value of 6.41.
   3. Exterior Finish: High performance organic coatings.
   4. Interior Finish: High performance organic coatings.
   5. Products:
      a. Mapes Industries; Mapes R: https://mapes.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

D. Swing Doors: Glazed aluminum.

1. Thickness: 1-3/4 inches.
2. Top Rail: 4 inches wide.
3. Vertical Stiles: 4-1/2 inches wide.
4. Bottom Rail: 10 inches wide.
5. Finish: Same as storefront.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Fasteners: Stainless steel.

D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.07 FINISHES

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

B. High Performance Organic Coating: AAMA 2604; multiple coats, thermally cured fluoropolymer system.

2.08 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: Storefront manufacturer's standard type to suit application.
   1. Finish on Hand-Contacted Items: TBD.
   2. For each door, include butt hinges, pivots, push handle, pull handle, exit device, narrow stile handle latch, and closer.

C. Coordinate doors and hardware with controlled access requirements including card-readers and electric devices.

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. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.

K. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 08 8000.

L. 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 non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for general testing and inspection requirements.

B. 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.

C. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

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

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units, and assemblies.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 08 4313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

1.03 REFERENCE STANDARDS

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

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

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

E. ASTM C1036 - Standard Specification for Flat Glass; 2025.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.

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

I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.

K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

L. GANA (GM) - GANA Glazing Manual; 2022.

M. GANA (SM) - GANA Sealant Manual; 2008.

N. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

O. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

P. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

Q. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.04 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.

1.05 SUBMITTALS

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

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 inch by 12 inch in size of glass units.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

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

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.06 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 three years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
   1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.
      a. North American Contractor Certification (NACC) for glazing contractors.

1.07 FIELD CONDITIONS

A. 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 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Manufactuers and Fabricators shall be one of the folllowing:
   1. Viracon, Inc: www.viracon.com/#sle.
   2. Anemostat.
   3. Guardian Glass
   4. Oldcastle Building Envelope
   5. Pilkington North America
   6. Tehcnical Glass Products
   7. SaftiFirst

8. Schott North America
9. Vetrotech Saint-Gobain
10. Vitro Architectural Glass
11. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. 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 thick, minimum.

2.04 INSULATING GLASS UNITS

A. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Black.
   5. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.

b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.

C. Type IG-1 - Insulating Glass Units: Vision glass, exterior double glazed. Low-E
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
a. Tint: Clear.
4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Basis of Design:
a. Clear Insulating unit North Orientations
1) PPG Solarban 70XL Starphire (2) Clear + Clear
2) VT >= 64%
3) SHGC <= 0.27
b. Clear Insulating unit South, East and West Orientations
1) PPG Solarban 70XL Solargray (2) + Clear
2) VT >= 31%
3) SHGC <= 0.19
7. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.26, nominal.

2.05 GLAZING UNITS

A. Type G-2 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated or where safety glazing is re.
2. Glass Type: Annealed float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

B. Type G-3 - Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
a. Glazed lites in doors, except fire doors.
b. Glazed sidelights to doors, except in fire-rated walls and partitions.
c. Other locations required by applicable federal, state, and local codes and regulations.
d. Other locations indicated on drawings.
2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

2.06 GLAZING COMPOUNDS

A. Type GC-1 - Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; gray color.

B. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

C. Type GC-3 - Polysulfide Sealant: Two component; chemical curing, nonsagging type; ASTM C920 Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

D. Type GC-4 - Polyurethane Sealant: Single component, chemical curing, nonstaining, nonbleeding; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 20 to 35; _____ color.

E. Type GC-5 - 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.

F. Manufacturers:

1. Dow Corning Corporation; _____: www.dowcorning.com/construction/#sle.Dow Corning Corporation; _____: www.dowcorning.com/construction/#sle.
2. Pecora Corporation; _____: www.pecora.com/#sle.
3. Tremco Commercial Sealants & Waterproofing; Proglaze: www.tremcosealants.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch 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.
1. Width: As required for application.
2. Thickness: As required for application.
3. Spacer Rod Diameter: As required for application.
4. Manufacturers:
   a. Tremco Global Sealants; _____: www.tremcosealants.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

D. Sliding Glass Reception Window Hardware: Knape and Vogt Roll-Ezy Aluminum Track set for 1/4" glass or approved equal, including double upper track, nylon roller press, vinyl guides, door shoe, double lower track, keyed cylinder lock to provide a complete assembly that connot be lifted out of place when opening is in locked position.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 FIELD QUALITY CONTROL

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

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove nonpermanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Resilient sound isolation clips.

E. Acoustic insulation.

F. Gypsum sheathing.

G. Cementitious backing board.

H. Gypsum wallboard.

I. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 4000 - Cold-Formed Metal Framing: Structural steel stud framing.

C. Section 07 2100 - Thermal Insulation: Acoustic insulation.

D. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

E. Section 09 2216 - Non-Structural Metal Framing.

1.03 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.

D. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.

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

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

H. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

I. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

J. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.

K. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

L. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

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

N. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

O. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.

P. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2024.

Q. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018 (Reapproved 2023).

R. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).

S. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.

T. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019 (Reapproved 2024).

U. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

V. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

W. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

X. ASTM E413 - Classification for Rating Sound Insulation; 2022.

Y. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

1.04 SUBMITTALS

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

B. Product Data:
   1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of 50-54 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Grid Suspension Systems: Provide grid suspension systems in accordance with ASTM C840 and GA-216 complying with the following:
   1. ICC-ES Evaluation Report No. _____.

2.02 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

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.
   1. Studs: C-shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
   4. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.
   5. Resilient Sound Isolation Clips: Steel resilient clips with molded rubber isolators, attaches to framing; improves noise isolation performance of wall and floor-ceiling assemblies.

C. Shaft Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

E. Non-structural Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

F. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.
   1. Products:
      a. CertainTeed Corporation; ____: www.certainteed.com/ceilings-and-walls/#sle.
      b. USG Corporation; Drywall Suspension System: www.usg.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   4. National Gypsum Company: www.nationalgypsum.com/#sle.
   5. PABCO Gypsum: www.pabcogypsum.com/#sle.
   6. USG Corporation: www.usg.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   3. Unfaced fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   4. 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.
   5. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   6. Paper-Faced Products:
      a. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.

b. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
c. USG Corporation; Sheetrock Brand Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.

7. Mold-Resistant, Paper-Faced Products:
   a. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
   b. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
   c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: www.goldbondbuilding.com/#sle.
   d. USG Corporation; Sheetrock Brand EcoSmart Panels Mold Tough Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.
8. Glass Mat Faced Products:
   a. CertainTeed Corporation; 5/8" GlasRoc Interior Type X: www.certainteed.com/#sle.
   b. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough Regular 5/8 in. (15.9 mm): www.usg.com/#sle.

C. Impact Resistant Wallboard:
1. Application: At areas where indicated on the Drawings..
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Type: Fire-resistance-rated Type X, UL or WH listed.
4. Thickness: 5/8 inch.
5. Edges: Tapered.
6. Paper-Faced Products:
   a. American Gypsum Company; M-Bloc IR Type X: www.americangypsum.com/#sle.
   b. USG Corporation; Sheetrock Brand Mold Tough VHI Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.
   c. Substitutions: See Section 01 6000 - Product Requirements.
7. Glass Mat Faced Products: Noncombustible, moisture-resistant gypsum core encased in a fiberglass face and back that shed water. Provide minimum 20-gauge (0.0296 inch) (0.752 mm) steel studs, as defined by the Steel Stud Manufacturers Association (SSMA). Non intended for exterior applications or constant exposure to water. Protect from immersion in water and the eroding effects of cascading water. Product is not suitable for use as a substrate for tile in wet areas such as tubs, showers, gang shower and other areas subject to direct water exposure. Refer to Gypsum Association's GA-216 reference guide, or ASTM C840 reference standard for additional installation requirements.

D. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas, including manufactured housing, tub and shower surrounds, and shower ceilings.
2. Application: Horizontal surfaces behind tile in wet areas including countertops and _____.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
   a. Thickness: 1/2 inch.

E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 1/2 inch.
3. Edges: Tapered.

F. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
2. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.

3. Core Type: Type X.
4. Type X Thickness: 5/8 inch.
5. Edges: Square.
6. Glass Mat Faced Products:
    a. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com/#sle.
    b. USG Corporation; Securock Brand UltraLight Glass-Mat Sheathing Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.

G. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
2. Types: Type X, in locations indicated.
3. Type X Thickness: 5/8 inch.
4. Edges: Tapered.

H. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Paper-Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
2. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
3. Paper-Faced Products:
    a. CertainTeed Corporation; M2Tech Type X Shaftliner: www.certainteed.com/#sle.
    b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Shaftliner XP: www.goldbondbuilding.com/#sle.
    c. USG Corporation; Sheetrock Brand Gypsum Liner Panels 1 in. (25.4 mm) SLX: www.usg.com/#sle.
4. Framing: Gypsum Liner Panels attach to metal framing; CH studs. Refer to product data sheet for additional information.
5. Manufacturers - Metal Framing, Connectors, and Accessories:
    a. CEMCO; ____: www.cemcosteel.com/#sle.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: per wall type in inch.

B. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
2. Tape Thickness: 1/4 inch.

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
2. L-Trim with Tear-Away Strip: Sized to fit 1/2-inch thick gypsum wallboard.
3. Architectural Reveal Beads:
    a. Reveal Depth: 1/2 inch.
    b. Reveal Width: 1/2 inch.
    c. Shapes: As indicated on drawings.
4. Expansion Joints:
    a. Type: V-shaped metal with factory-installed protective tape.

E. Decorative Metal Trim:
1. Material: Extruded aluminum alloy 6063-T5 temper.

2. Finish: Anodized, clear.
3. Type: Profile as selected from manufacturer's standard range.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Joint Compound: Setting type, field-mixed.

G. Finishing Compound: Surface coat and primer, takes the place of skim coating.

H. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

I. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

J. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

K. Exterior Soffit Vents: One piece, perforated, ASTM B221 6063 T5 alloy aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
1. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C1007AISI S220 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
1. Level ceiling system to a tolerance of 1/1200.
2. Laterally brace entire suspension system.
3. Install bracing as required at exterior locations to resist wind uplift.

C. Studs: Space studs as permitted by standard.
1. Extend partition framing to structure where indicated and to ceiling in other locations.
2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

C. 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.

D. Acoustical Shielding: Install in accordance with manufacturer's instructions for application between studs and gypsum board.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

D. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.

E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

F. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

E. Moisture Guard Trim: Install on bottom edge of gypsum board throughout building.

F. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.

3.07 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
   4. Level 0: Temporary partitions.
   5. Level 0: Surfaces indicated to be finished in later stage of project.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
   3. Taping, filling, and sanding are not required at base layer of double-layer applications.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for wall applications.

B. Tile for floor applications.

C. Ceramic accessories.

D. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

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

B. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

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

B. ANSI A108.01 - General Requirements: Structures, Substrates, and Preparation of Tile; 2023.

C. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.

D. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

E. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2024.

F. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.

G. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2023.

H. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.

I. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2024).

J. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

K. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

1.04 SUBMITTALS

A. See Section 01 3000 - Submittal Procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, water proof membrane, and accessories. Include instructions for using grouts, water proof membrane, and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

1. Shop drawings to indicate slope in addition to tiles that are required to be cut, mitered, and/or modified to achieve positive drrainage to all floor drain locations as noted in the Drawings.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.

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

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 10 s.f. of each type.

1.05 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

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

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 MOCK-UPS

A. See Section for general requirements for mock-up.

B. Construct tile mock-up where required by Architect, incorporating all components specified for the location.
   1. Minimum size of mock-ups is 10' X 10", required for walls & floors. Mock-ups to include tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
   2. Approved mock-up may remain as part of work.
   3. Demolish mock-up when directed by Architect, and remove debris from the site.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees Fahrenheit and below 100 degrees Fahrenheit during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Basis of Design Products **(TL-1)(WT-1, WT-2, WT-3, WT-4, WT-5, WT-6)**: Subject to compliance with requirements, provide the products listed in the Drawing Finish Key. Specific tile products are identified in the drawings to establish the color, design intent, and required standard of quality. It is not the intent to preclude the use of other prior approved, acceptable manufacturers.

B. Substitutions: Subject to compliance with requirements, products of the following manufacturers may be substituted for prior approval upon matching Architect's control sample in color, texture, construction and performance characteristics. Final approval to be determined by Architect.

C. Ceramic Wall and Mosaic Tile: ANSI A137.1, non-vitreous body (absorption less than 0.5 percent), thickness varies by product, cushion edges, factory mounted (mosaic).
   1. Trim Shapes: As required of same type, size, thickness and material as tile.

D. Porcelain Tile: A ceramic tile or paver tile that is generally made by the dust-pressed method of a composition resulting in a tile that is dense, impervious, fine grained, and smooth with sharply formed face.

E. Glass Tile: A glass tile that is suitable for interior use and which is usually non-vitreous and is not required nor expected to withstand excessive impact or to be subject to freezing and thawing conditions.

F. Wall Tile: A glazed tile with a body that is suitable for interior use and which is usually non-vitreous and is not required nor expected to withstand excessive impact or be subject to freezing and thawing conditions.

G. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.
   1. Fabricate thresholds to heights indicated, but not more than 1/2 inch above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

H. Tile Base: TB-1
   1. Manufacturer: Refer to the Interior Finish Schedule
   2. Product: Refer to the Interior Finish Schedule
   3. Color: Refer to the Interior Finish Schedule

2.02 WATERPROOFING MEMBRANE:

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is acceptable to authorities having jurisdiction for use as shower pan waterproofing, as selected from one of the following available options. Include primer, pre-fabricated corners, seaming cement, detail tape sealant, integrated drain and other standard accessory products required for application provided by membrane manufacturer. At Showers use complete shower system as manufactured by Schluter. In restrooms install Schluter KERDI waterproofing membrane on entire floor of restroom and up wall minimum 1", install waterproofing membrane into integral floor drain bonding flange & floor drain.

B. Material Description: 0.008" 8 mil thick, polyethylene membrane, with polypropylene fleece laminated on both sides, which meet or exceed the requirements of the "American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation A118.10", and is listed by cUPC, and is evaluated by ICC-ES (see Report No. ESR-2467).

C. Manufacturer:
   1. Schluter-KERDI, as manufactured by Schluter Systems.

D. Accessories:
   1. Waterproofing seaming membrane - Schluter KERDI-BAND Seams and Corners, 0.004" 4 mil thick.
   2. Mixing Valve seals and pipe seals.
   3. Floor drain: Schluter 4"x4" KERDI-Drain with integral bonding flange and no hub fitting, coordinate bonding flange with plumbing PVC or Stainless steel as required.(size and shape as indicated in Drawings).
      a. Drain grate pattern and finish to be selected by Architect from manufacturer's full range.
   4. Prefabricated, sloped tiled shower tray base.

2.03 CRACK ISOLATION MEMBRANE UNDERLAYMENTS

A. General: Manufacturer's standard product that complies with ANSI A118.12 as selected from one of the following options. Include primer, pre-fabricated corners, seaming cement, detail tape, sealant, and other standard accessory products required for application provided by membrane manufacturer.

B. Fluid-Applied Crack Isolation Membrane Underlayment:
   1. Description: Manufacturer's proprietary system consisting of liquid applied component and synthetic fabric sheet reinforcement.
   2. Manufacturers and Products:
      a. Custom Building Products: RedGard Waterproofing and Crack Prevention Membrane.
      b. Laticrete International Inc.; Laticrete 9235 Waterproof Membrane.
      c. Laticrete International Inc.; Blue 92 Anti-Fracture Membrane.
      d. Mapei Corp; Mapelastic HPG.

C. Fluid-Applied Waterproofing and Crack Isolation Membrane to be installed on ALL walls with tile in restrooms. Membrane to be installed full height in showers, as part of shower system indicated elsewhere in this Section

D. Faced Chlorinated Polyethylene (CPE) Crack Isolation Membrane Underlayment:
   1. Description: Non-plasticized, chlorinated polyethylene faced on both sides with high-strength, nonwoven polyester fabric; minimum 0.030 inch nominal thickness.
   2. Manufacturer and Product: The Noble Company; NobleSeal CIS.

2.04 SETTING MATERIALS

A. Manufacturers:
   1. Custom Building Products.
   2. MAPEI Corporation.
   3. Summitville Tiles, Inc.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
   1. Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.
      a. For wall applications, provide non-sagging mortar that complies with Paragraph F-4.6.1 inch addition to the other requirements in ANSI A118.4.

C. Medium Thin-set Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for thin-set application.
   1. Basis of Design Product: Subject to compliance with requirements, provide Custom Building Products MegaLite Non-Sag Rapid Set Mortar or a comparable product from one of the following:
      a. MAPEI Corporation; Ultraflex LFT.
      b. Summitville Tiles, Inc.; S-1200 MP Premium Medium Bed Mortar.
   2. Application: Large format tile installations. Refer to the Drawing Finish Legend for tile sizes.

D. For wall applications, provide mortar that complies with requirements for non-sagging mortar in addition to the other requirements in ANSI A118.4.

2.05 GROUT MATERIALS

A. Manufacturers:
   1. Custom Building Products
   2. MAPEI Corporation
   3. Summitville Tiles, Inc.

B. Water-Cleanable Epoxy Grout: ANSI A118.3.
   1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 degrees Fahrenheit, respectively, and certified by manufacturer for intended use.

2.06 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants".
   1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      a. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

2.07 CEMENTITIOUS BACKER UNITS

A. Refer to Section 09 2116 "Gypsum Board Assemblies" for cementitious tile backer board to be provided by that Section.

2.08 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
   1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 degrees Fahrenheit per ASTM D 87.
   2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Edge Strips (Where Indicated): Angle, radius or L-shape, height to match tile and setting-bed thickness, metallic or PVC or neoprene base, designed specifically for flooring applications.
   1. Basis of Design Product: Schluter Systems, LP transitions and reducers or a comparable approved product of one of the following:
      a. Blanke Corporation
      b. Ceramic Tool Company, Inc.
   2. Tile to Carpet: Schluter - Model as indicated on drawings.
   3. Tile to Tile, Edge Termination or Transitions As Indicated: Schluter - Model as indicated on drawings.
   4. Tile to Wood Flooring: Schluter - Model as indicated on drawings.
   5. Tile Floor to Wall Transition: Schluter - Model as indicated on drawings.
   6. Tile Expansion Joints: Schluter - Model as indicated on drawings.

E. Waterproofing membrane, crack isolation membrane underlayment, shower systems, and floor drain assembly, install as per manufacturer's written requirements.

2.09 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.

b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

E. Slope finished flooring to drain, 2% slope max. Floor materials to be cut, mitered, and/or modified as required to achieve positive drainage in entire room to all floor drain locations. Provide proper notation in shop drawings. Positive drainaing to be verified in the field by the Contractor.

3.03 CRACK ISOLATION MEMBRANE UNDERLAYMENT INSTALLATION

A. General Requirements:
1. If required by manufacturer, prime concrete substrate.
2. Install to produce a continuous crack isolation membrane of uniform thickness bonded securely to substrate, without wrinkles, bubbles, buckles, or kinks.
3. For sheets, overlap and seal seams.
4. For liquid applied products, brush or roll liquid uniformly over area in number of coats required and install reinforcing fabric.
5. Roll installed sheet if required by manufacturer.
6. After installation of tile, install floor joint sealant in tile joints recommended by manufacturer to coordinate with membrane strips.

3.04 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
a. Tile floors in wet areas.
b. Tile floors composed of tiles 8 by 8 inches or larger.

B. Extend tile work into recesses and under or behind millwork, casework, equipment and fixtures to form complete floor and/or wall covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for

straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
   2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Porcelain Paver Tile: 1/8 inch or according to manufacturer's recommendation.
   2. Porcelain Mosaic Tile: 1/16 inch or according to manufacturer's recommendation.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
   2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealers".

I. Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

J. Grout tile to comply with requirements of the following tile installation standards:
   1. For epoxy tile grouts, comply with ANSI A108.6.

3.05 INSTALLATION - WALL TILE

A. Over cementitious backer units install in accordance with TCNA (HB) Method W223, organic adhesive.

B. Field-Applied Temporary Protective Tile Coating: Apply a continuous film to protect tile surfaces from adhesion of grout.

C. Back Buttering: Produce 100 percent mortar coverage on tile backs to comply with applicable special requirements for back buttering in ANSI A108 Series tile installation standards in the following locations:
   1. Wall installations composed of 8-by-8-inch tile or larger.

D. Blending: For tile with color variations, install blended tiles to produce color variations that match approved Samples.

E. Extend tile work into recesses and under or behind millwork, casework, equipment and fixtures to produce a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

F. Accurately form intersections and returns. Cut and drill tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items to produce straight aligned joints. Fit tile to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

G. Jointing Pattern: Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths.
   1. Lay tile in grid pattern.

H. Joint Widths: Produce uniform joint widths as follows:
   1. Wall Tile: Per manufacturer's recommendations

I. Refer to TCA's "Handbook for Ceramic Tile Installation" and to ANSI A108 Series of tile installation standards for data on expansion joints. Both the "Handbook" and standards require joints to be shown on Drawings. Descriptive specifications are not an adequate substitute for showing joints on Drawings.

J. Expansion Joints: Form expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.
   2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

3.06 CLEANING AND PROTECTION

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
   3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven (7) days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.07 WALL TILE INSTALLATION SCHEDULE

A. Tile Installation: Interior wall installation over backer board; thin-set mortar; W244C (wet conditions) with cementitious backer board and waterproof membrane; W243 (dry conditions) with Type X gypsum board; ANSI A108.5.
   1. Tile Type: As indicated in the Drawing "FINISH KEY".
   2. Thin-Set Mortar: Latex-Portland cement mortar or according to manufacturer's recommendation.
   3. Medium Thin-Set Mortar for Large Format Tiles: Mortar indicated or manufacturer's recommended mortar.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 2100 - Thermal Insulation: Acoustical insulation.

1.03 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 12 by 12 inch in size illustrating material and finish of acoustical units.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

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.

C. Fire-Performance: Provide acoustical panels with surface burning characteristics specified below, based on ASTM E 84 tests performed by UL or other independent agency acceptable to authorities having jurisdiction. Identify packaged products with approval markings of test agency.
   1. Flame Spread: 25 or less.
   2. Smoke Developed: 50 or less.

D. Coordination: Coordinate layout and installation of ceiling system with related construction.

1.07 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. USG Corporation: www.usg.com/ceilings/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

2.03 ACOUSTICAL UNITS

A. Acceptable Manufacturers: Acoustical ceiling systems are based on the products of manufacturers listed below and as indicated in the Drawing Finish Key.
   1. USG Corporation
   2. Armstrong World Industries, Inc

B. Acoustical Units - General: ASTM E1264, Class A.

C. Acoustical Tiles, Type AC-1: Painted mineral fiber, with the following characteristics:
   1. Application(s): All rooms shown with AC-1 2'x4' ceiling tiles on the reflected ceiling plans.
   2. Classification: ASTM E1264 Type A.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: 82 percent, determined in accordance with ASTM E1264.
   5. NRC Range: 0.70, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 0.40, determined in accordance with ASTM E1264.
   7. Panel Edge: Square.
   8. Tile Edge: Square.
   9. Color: White.
   10. Suspension System Type Armstrong Prelude 15/16": Exposed grid.
   11. Products:
      a. Armstrong World Industries, Inc; SCHOOL ZONE Fine Fissured High NRC Item No. 1714 : www.armstrongceilings.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

D. Acoustical Panels, Type AC-2: Mineral fiber with scrubbable finish, with the following characteristics:
   1. Application(s): Food Service, toilet rooms and associated rooms.
   2. Classification: ASTM E1264 Type A, Form A3 - Mineral fiber with scrubbable finish, typical in commercial kitchen/food prep areas..
   3. Size: 24 by 24 inches .
   4. Thickness: 5/8 inches.
   5. Light Reflectance: >75 percent, determined in accordance with ASTM E1264.
   6. Panel Edge: Square.
   7. Color: White.
   8. Suspension System Type Armstrong Prelude XL HRC (Aluminum): Exposed grid.
   9. Products:
      a. USG Corporation; Kitchen Lay-In Panels: Item no. 3210 www.usg.com/ceilings/#sle.

b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 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.
   1. Materials:
      a. Aluminum Grid: Aluminum sheet, ASTM B209/B209M.

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.

E. Gypsum Board: Fire rated type; 5/8 inch thick, ends and edges square, paper faced.

F. 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 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient tile flooring.

C. Resilient base.

D. Resilient stair accessories.

E. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.04 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented 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 and 90 degrees F.

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 to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 SHEET FLOORING

A. Vinyl Sheet Flooring - SV-1: Resilient vinyl sheet floor covering with backing complying with ASTM F1303.
   1. Basis of Design Manufacturer: Subject to compliance with requirements, provide the products listed in the Drawing Finish Key. Specific vinyl sheet products are identified in the drawings to establish the color, design intent, and required standard of quality. It is not the intent to preclude the use of other prior approved, acceptable manufacturers.
      a. Basis of Design: Gerflor Tarasafe Ultra Commercial Sheet Flooring; gerflorusa.com
      b. Or prior approved equal.
   2. Thickness: 0.080 inch nominal.
   3. Sheet Width: 6'-6"
   4. Sheet Roll Length: 66 feet.
   5. Seams: Heat welded.
   6. Integral coved base with cap strip.
   7. Color: To be selected by Architect from manufacturer's full range.

B. 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 TILE FLOORING

A. Luxury Vinyl Tile **(LVT-1, LVT-2, LVT-3, LVT-4)**: Solid vinyl with color and pattern throughout thickness, and:
   1. Manufacturers:
      a. Basis of Design Product: Subject to compliance with requirements, provide the products listed in the Drawing Finish Key. Specific luxury vinyl tiles are identified in the drawings to establish the color, design intent, and required standard of quality. It is not the intent to preclude the use of other prior approved, acceptable manufacturers.
      b. Interface: www.interface.com.
      c. Mannington Commercial: www.manningtoncommercial.com.
      d. Or prior approved equal.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Slip Resistance (ASTM D2047) >0.55 wet/dry, ADA compliant
   4. Static Load Limit (ASTM F970): 1500 psi
   5. Flexibility (ASTM F137): Passes
   6. Resistance to Heat (ASTM F1514): Passes
   7. Resistance to Light (ASTM F1515): Passes
   8. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648, NFPA 253, ASTM E648, or NFPA 253.
   9. Smoke Density (ASTM E662) less than or equal to 450
   10. Size: As indicated in Drawing Finish Key.
   11. Wear Layer: 22 mil
   12. Total Thickness: 4.5 mm
   13. Pattern: As indicated in Drawing Finish Key, or as selected by Architect from manufacturer's full range..
   14. Color: As indicated in Drawing Finish Key.

2.03 STAIR COVERING

A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness. Refer to Interior Finish Schedule for additional information.
   1. Manufacturers:
      a. Basis of Design: Roppe Corporation; Rubber Stair Treads: www.roppe.com/#sle.

b. Tarkett Flooring: www.tarkett.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.
2. Nosing: As indicated on the Drawings..
3. Color: As indicated on drawings.
4. Color: To be selected by Architect from manufacturer's full range.

2.04 RESILIENT BASE

A. Resilient Base **(RB-1)**: ASTM F1861, Type TP, rubber, thermoplastic; top set Style A, Straight.
1. Manufacturers:
a. Basis of Design: Tarkett Company; Baseworks: www.commercial.tarkett.com.
b. Roppe Corp: www.roppe.com.
c. Or prior approved equal.
2. Height: 4 inch (__ mm).
3. Thickness: 3/8 inch (____ mm).
4. Length: 8 foot (2.4 m) sections.
5. Color: As indicated on drawings.
6. Thickness 1/4"

2.05 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Test as Follows:
a. Alkalinity (pH): ASTM F710.
b. Internal Relative Humidity: ASTM F2170.
c. Moisture Vapor Emission: ASTM F1869.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

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.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
1. Spread only enough adhesive to permit installation of materials before initial set.
2. Fit joints and butt seams tightly.
3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

E. Install flooring in recessed floor access covers, maintaining floor pattern.

F. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.04 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

B. Seal seams by heat welding where indicated.

C. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

3.05 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.06 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.07 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

3.08 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.09 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6566
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vinyl sheet flooring, adhesively installed.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

C. ASTM F2772 - Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate flooring installation requirements with concrete work.

B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

1.05 SUBMITTALS

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

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.

E. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.
   1. Include samples of game lines, illustrating colors selected.

F. Test Reports: Submit test reports showing compliance with ASTM F2772.

G. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

H. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.

I. Manufacturer's Instructions: Indicate standard and special installation procedures and perimeter conditions requiring special attention.

J. Manufacturer's qualification statement.

K. Installer's qualification statement.

L. Testing agency's qualification statement.

M. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 10 square yards matching installed flooring.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

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

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

1.07 MOCK-UPS

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

B. Construct _____ mock-up, ___ feet long by ____ feet wide, indicating _____.

C. Locate where directed.

D. Mock-up may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.09 FIELD CONDITIONS

A. The permanent HVAC system must be operational and set to a minimum of 65 degrees F for a maxuimum of 85 degrees F for a minimum of 7 days prior to, during and after installation.

1.10 WARRANTY

A. High Moisture Management Solutions (10 Year Warranty)
   1. **Concrete with %RH <99%, MVER </=10, pH < 11**
      a. Apply USG Advanced skim coat as necessary for patch/skim coat.
      b. Install flooring with Shaw 4151* adhesive.
   2. **Concrete with %RH >/= 99%, MVER </=12, pH </= 12**
      a. Apply Shaw Surface Prep EXT followed by Shaw Moisture Shield.
      b. Apply USG Advanced skim coat as necessary for patch/skim coat.
      c. Install flooring with Shaw 4151* adhesive.
   3. **Concrete with %RH >/= 99%, MVER </= 17, pH> 12**
      a. Apply Surface Prep
      b. Apply Shaw Moisture Shield.
      c. Apply MRP
      d. Apply USG Advanced Skim Coat as necessary for patch/skim coat.
      e. Install flooring with Shaw 4151* adhesive
   4. **Concrete with %RH >/= 99%, MVER >17, pH> 12**
      a. Apply Shaw Surface Prep EXT followed by Shaw MoistureTek.
      b. Apply USG Advanced skim coat as necessary for patch/skim coat.
      c. Install flooring with Shaw 4151* adhesive.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Basis of Design: Patcraft; bounce back 6.5, I208V; https://pdmsview.shawinc.com/
   2. Mondo America, Inc; _____: www.mondoworldwide.com/#sle.
   3. Robbins Sports Surfaces; _____: www.robbinsfloor.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Vinyl Sheet Flooring:
   1. Wearing Surface: Heterogeneous vinyl sheet flooring
   2. Sheet Thickness: Minimum 0.256 inches inch, nominal.
   3. Sheet dimensions: 70.9 in x 49.2 in
   4. Tensile Strength: Minimum 1000 psi, per ASTM D412.

5. Durometer Hardness, Type A: Minimum of 65, when tested in accordance with ASTM D2240.
6. Seaming Method: Welding with heat or chemical.
7. Surface Texture: Smooth.
8. Color: As selected by the Architect from the manufacturer's full color range..

2.02 ACCESSORIES

A. Adhesives:

1.	Lokworx Resilient	95% RH	8 lbs	pH 10
2.	Lokworx+ Resilient			
3.	S150 spray	95% RH	NA	pH 11
4.	Shaw 4151 for high moisture	99% RH	10 lbs.	pH 12
5.	Shaw 200 for low demand areas	85% RH	5 lbs	pH 5-9

B. Primer: Shaw 9050

C. Leveling and Patching Compounds: Use only Portland-based patching and leveling compounds. Do not install resilient flooring over gypsum-based patching and/or leveling compounds.

D. Shaw MRP: Barrier Primer over concrete, Old Cut Back Adhesive, Chemically Abated Floors or other solid surfaces

E. Weld Rods

F. FinishWorx Transition Strips (Micro Transition, Metal TrimMaster)

G. FinishWorx Cove Base Accessories:
   1. Profile as selected by the Architect.

H. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. 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 athletic flooring to substrate.

C. Ensure that moisture tests have been conducted and that the results do not exceed 90% In-Situ relative humidity when tested according to ASTM F 2170.

D. PH of concrete sub-floor surface is no greater than 10.

E. The permanent HVAC system turned on and set to a minimum of 68°F (20°C) for a minimum of 72 hours prior to, during and after installation. After the installation, the temperature should not exceed 100°F.

F. Flooring material and adhesive need to be acclimated to the installation area for a minimum of 48 hours prior to installation.

G. Refer to adhesive label for proper roller or trowel requirements

H. Material should always be visually inspected prior to installations. Any material installed with visual defects will not be considered a legitimate claim as it pertains to labor cost.

I. Install all cuts and rolls in consecutive sequence.

J. Ensure that all recommendations for sub-floor and job site conditions are met prior to beginning the installation. Once the installation has started, you have accepted these conditions.

K.

L. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates per the flooring and adhesive manufacturers instructions.

B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.

C. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

D. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Resilient Sheet Flooring:
   1. Unroll flooring and allow to relax before beginning installation.
   2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
   3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
   4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
   5. Weld seams using techniques and equipment recommended by manufacturer.
   6. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
   7. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

B. Section 07 1616 - Crystalline Waterproofing: Concrete Sealent

1.03 REFERENCE STANDARDS

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

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

F. CRI - The Carpet and Rug Institute; Current.

G. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

H. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Submittal Procedures. For carpeting, Owner shall also review carpet submittals.

B. Product Data: For each type of carpet material, carpet cushion, and installation accessory specified. Submit manufacturer's printed data on physical characteristics, durability, fade resistance, and fire-test-response characteristics. Submit methods of installation for each type of substrate.

C. Shop Drawings showing columns doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet. Indicate the following:
   1. Carpet type, color and dye lot.
   2. Locations where dye lot changes occur.
   3. Seam locations, types, and methods. Avoid "slivers" to the greatest extent possible; if unavoidable, "slivers" shall be located in least trafficked areas. Seams in wall openings shall be centered on the wall. If the opening has a door, seams shall be centered beneath the door in closed position.
   4. Type of subfloor.
   5. Type of installation.
   6. Pile direction.
   7. Transition details to other flooring materials.

D. Samples for verification of the following products, in manufacturer's standard sizes, showing the full range of color, texture and pattern variations expected. Prepare samples from the same material to be used for the Work. Label each sample with manufacturer's name, material type, color, pattern, and designation indicated on Drawings and carpet schedule. Submit the following:

1. 12-inch square samples of each type of carpet material required.
2. 12-inch samples of each type of exposed edge stripping and accessory item.

E. Schedule of carpet using same room designations indicated on Drawings.

F. Manufacturer's Installation Instructions: Indicate special procedures. Manufacturer's statement of acceptance of compatibility of concrete slab curing/sealing materials with carpet adhesive.

G. Testing Results from Indenpendent Testing Laboratory from previously manufactured carpet materials of identical type to this project illustrating compliance with specified project criteria.

H. Maintenance data for carpet to be included in the operation and maintenance manual specified in Division 1. Include the following:
1. Methods of maintaining carpet, including manufacturer's recommended frequency for maintaining carpet.
2. Precautions for cleaning materials and methods that could be detrimental to finishes and performance. Include cleaning and stain-removal products and procedures.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed but not less than 30 sq feet of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is certified by the Floor Covering Installation Board (FCIB) or who can demonstrate compliance with FCIB certification program requirements.

B. Single-Source Responsbility: Obtain each type of carpet from one source and by a single manufacturer.

C. All carpet shall be first quality of American manufacturer and all yarn shall be BASF, ZEFTRON 2000 (R).

D. Provide flooring material to meet the following test performance criteria as tested by a recognized independent testing laboratory. Certified test reports shall be submitted by the carpet manufacturer for each test method. Requirements listed below must be met by all products being submitted for approval:
1. Pill Test / DOC-FF-1-70 (ASTM D 2589) - Requiement: Pass
2. Flooring Radiant Panel / ASTM E648 - Requirements: Class I (Above 0.45 w/cm).
3. CRI VOC Chamber Test/Indoor Air Quality test (CRI-IAQ) Green Label Plus Test.
4. Lightfastness: Rating of not less than 5 on International Grey Scale after 40 SFU's when tested in accordance with AATCC Test Method 165.
5. Crockfastness: Minimum stain rating on International Grey Scale of not less than 5 wet or dry when tested in accordance with AATCC Test Method 165.
6. Atmospheric Fading: Burned Gas shall not be less than 5 on International Grey Scale after two cycles on each test as per AATCC Test Method 129 Ozone and AATCC Test Method 23.

E. Testing: Owner Provided Independent Testing Laboratory will test random samples of actual materials delivered to the site, one sample for each 10,000 sf of carpeted area illustrating compliance with specified project criteria.

1.06 DELIVERY, STORAGE AND HANDLING

A. Comply with the Carpet and Rug Institute's CRI 104, Section 5: "Storage and Handling".

B. Deliver materials to Project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.

C. Store materials on-site in original undamaged packages, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, with continuous blocking off ground.

1.07 PROJECT CONDITIONS

A. Comply with CRI 104, Section 6: "Site Conditions".

B. Space Enclosure and Environmental Limitations: Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and normally dry, work above ceilings is complete and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

C. Subfloor Moisture Conditions: Moisture emission rate of not more than 3 lb/1000 sq. ft./24 hous (14.6 kg/1000 sq. m/24 hours) when tested by calcium chloride moisture test in compliance with CRI 104, 6.2.1, with subfloor temperatures not less than 55 degrees Fahrenheit.

D. Subfloor Alkalinity Conditions: A pH range of 5 to 9 when subfloor is wetted with potable water and pHydrion paper is applied.

1.08 WARRANTY

A. The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Carpet Warranty: Submit a written warranty executed by carpet manufacturer and installer agreeing to repair or replace carpet, including all labor and material for the removal of carpet to be replaced, slab preparation, shipping and installation of replacement material, that does not meet requirements for that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
   1. Warranty Period: Life of the installation.
   2. Warranty shall be non-prorated and shall protect against Excessive Surface Wear, no more than 10% face yarn loss; Excessive Static Electricity, more than 3.0 kV per AATCC 134; Resiliency Loss of the Backing, More than10% loss of backing resiliency; Delamination; Edge Ravel; Zippering; Superior tuft bind in high traffic environments (wet or dry); Adhesive Failure; Moisture Barrier Pre-coat and Backing; Bleach resistance color loss from diluted bleach; and Lifetime Stain Resistance.

C. Color Fastness Warranty: Submit a written warranty executed by the carpet manufacturer agreeing to repair or replace carpet, including all labor and material for the removal of carpet to be replaced, slab preparation, shipping and installation of replacement material should the yarn fail to maintain its color.
   1. Warranty Period for Lighting: Ten (10) Years
      a. Carpets shall resist change in color due to sunlight exposure to exceed the equivalent of 4.0 on the gray scale for color change as measured in accordance with AATCC Method 16E.
   2. Warranty Period for Atmospheric Conditions: Five (5) Years
      a. Capets will resist change in color due to atmostpheric contaminents (Ozone and Nitrous Oxides) as measured by AATCC 164 and AATCC 129. Tested carpet will not rate less than a 3.0 rating on the grey scale for color change.

D. Special Carpet Stain Warranty: Submit a written warranty executed by carpet manufacturer and installer agreeing to repair or replace carpet, including all labor and material for the removal of carpet to be replaced, slab preparation, shipping and installation of replacement material, and agreeing to reimburse the Owner for attempted removal of the stain should the carpet permanently stain.
   1. Warranty Period: Ten (10) Years
   2. This is not to be construed as a cleaning contract. Owner shall have attempted to remove the stain within three (3) working days after occurrence of the spill and notify carpet manufacturer immediately if the stain removal is unsuccessful.

E. Special Carpet Static Warranty: Submit a written warranty executed by carpet manufacturer and installer agreeing to repair or replace carpet, including all labor and material for the

removal of carpet to be replaced, slab preparation, shipping and installation of replacement material, should carpet cause static or induce malfunction of electronic equipment when installed throughout the equipment operation area.

1. Static is defined as the electric charge built up and later discharged from a person, cart, or other objects as a result of movement of that person or object upon the floor covering.
2. Malfunction is defined as any failure of the electronic equipment caused by carpet induced static electricity, providee the equipment is operating within specifications in every other respect.
3. Electronic Equipment is any computer, work processor, terminal, or other peripheral component communications processor, typesetter or broadcast equipment sold by a recognized manufacturer (or its authorized distributor, agent, or representative) and installed and serviced by qualified personnel.
4. Warranty Period: Life of the installation

PART 2 PRODUCTS

2.01 CARPET TILE

A. Basis of Design Product (C-1, C-2): Subject to compliance with requirements, provide the products listed in the Drawing Finish Key. Specific carpets are identified in the drawings to establish the color, design intent, and required standard of quality. It is not the intent to preclude the use of other prior approved, acceptable manufacturers.
   1. Basis of Design: As indicated in the Finish Key
   2. Patcraft
   3. Bentley: www.bentleymills.com.
   4. Interface
   5. Mannington
   6. J&J Industries
   7. Shaw Contract
   8. Tarkett
   9. Or Prior Approved Equal.

B. Size: As indicated in the Drawing Finish Key.

C. Applied Soil-Resistance Treatment: Manufacturer's standard material.

D. Antimicrobial Treatment: Manufacturer's standard material.

E. Moisture Barrier passes Moisture impact at 10,000 cycles; Passes British Spill Test

F. NSF/ASNI-140 Certification: Gold or higher

G. All materials for each carpet type shall be from the same "lot" number, including the required maintenance materials.

H. Performance Characteristics (C-1, C-2): As follows:
   1. Smoke Developed (Specific Optical Density): 450 or less (flaming) per NFPA 253 (NBS/AMINCO SMOKE CHAMBER)
   2. Pile Construction: Multi-Level Pattern Loop
   3. Yarn Type: 100% Recycled Content Nylon
   4. Fiber: TDX Nylon
   5. Stitches per Inch 9.0
   6. Total Thickness: 0.185 inch.
   7. Tufted Weight: 29 oz. / sq. yd
   8. Primary Backing: Synthetic
   9. Dye Method: 100% solution-dyed; no after-manufature dye methods will be acceptable.
   10. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC 16, Option E.
   11. Radiant Panel: Class 1
   12. NBS Smoke: Less than 450

13. Elastrostatic Propensity: Less than 3.5 kV per AATCC 134.
14. ADA Compliance: >0.6, meets the recommended static coefficient of friction for ADA walking surfaces and accessible routes.
15. Installation: Refer to Interior Finish Schedule

I. Environmental Requirements: Provide carpet tile that complies with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.

2.02 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Edge Strips: Embossed aluminum, color as selected by Architect from manufacturer's full range.

C. Adhesives: Water-proof, non-flammable, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements to installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
1. Minimum resistance levels of 99% RH, * MVERs and 12 pH
2. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive must be asbestos free.
4. Carpeting manufacturer to approve in writing that the adhesive is compatible with the carpeting.

D. Rubber Edge Strips: Rubber or vinyl in manufacturer's standard matching carpet, of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting performance of carpet. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that subfloors and conditions are satisfactory for carpet installation and comply with requirements specified in this Section and those of the following:
1. Carpet manufacturer.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
1. Test as Follows:
a. Alkalinity (pH): ASTM F710. Chemical PH shall be 10 or less.
b. Internal Relative Humidity: ASTM F2170. Relative Humidity shall be 90% or less prior to installation of the flooring
c. Moisture Vapor Emission: ASTM F1869.
2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Comply with carpet manufacturer's installation recommendations to prepare substrates indicated to receive carpet installation.

B. Level subfloor within 1/4 inch in 10 feet noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.
1. Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by the following:
a. Carpet manufacturer.

C. Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.

D. Broom or vacuum clean subfloors to be covered with carpet. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust.

E. Concrete-Subfloor-Preparation: Apply concrete-slab primer, according to manufacturer's directions, where recommended by the following:
   1. Carpet manufacturer.

F. Coordinate on-carpet and in-carpet items including but not limited to door stops, cleanouts, floor receptacles, thresholds for proper design function and fit. Carpet flanges for floor outlets and cleanouts shall accomplish level, flush walking surface.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Comply with carpet manufacturer's recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position. At wall openings, seams shall be centered on the wall. Do not bridge building expansion joints with continuous carpet. "Slivers" of carpet shall be avoided whereever possible, but if unavoidable shall be located in least-trafficked areas.

C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Extend carpet under all moveable furnishings, equipment or fixtures unless otherwise noted.

F. Install carpet tile in accordance with manufacturer's instructions.

G. Blend carpet from different cartons to ensure minimal variation in color match.

H. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

I. Lay carpet tile in ashlar pattern unless otherwise indicated in Drawings, with pile direction parallel to next unit, set parallel to building lines.

J. Fully adhere carpet tile to substrate.

K. Adhere carpet tile to substrate along centerline of rooms, at perimeter of rooms, where tiles are cut, and at 15 foot intervals throughout rooms. Lay remainder of tile dry over substrate.

L. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing installation.
   1. Remove visible adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove protruding yarns from carpet surface.
   3. Vacuum carpet using commercial machine with face-beater element.

B. Comply with CRI 104, Section 15: "Protection of Indoor Installation".

C. Provide final protection and maintenance conditions, in a manner acceptable to manufacturer and Installer, that ensure carpet is without damage or deterioration at the time of Substantial Completion.

D. Remove excess adhesive without damage, from floor, base, and wall surfaces.

E. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 7200
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall covering and borders.

1.02 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems; 2020.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.03 SUBMITTALS

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

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Samples: Submit two samples of wall covering, ____by____ inch in size illustrating color, finish, and texture.

E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.

F. Manufacturer's Installation Instructions: Indicate special procedures.

G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.
   3. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.04 QUALITY ASSURANCE

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

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.01 WALL COVERINGS

A. Wall Covering: jute-backed cork, complying with the following:
   1. Total Thickness: 1/4"
   2. Roll Length: 90 lineal feet.
   3. Roll Width: 48 inches.
   4. Color: As selected by the Architect.
   5. Manufacturers:
      a. MDC Interior Solutions; Dry Erase Cork; www.mdcwall.com/#sle.

B. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.

C. Termination Trim: Extruded plastic, color as selected by the Architect from the manufacturer's full range.

D. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

E. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.

E. Marks: Seal with shellac those that may bleed through surface finishes.

F. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

G. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Use wall covering in roll number sequence.

D. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

E. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

F. Butt edges tightly.

G. Overlap adjacent panels as recommended by manufacturer.

H. Horizontal seams are not acceptable.

I. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

J. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

K. Do not install wall covering more than 1/4 inch below top of resilient base.

L. Cover spaces above and below windows, above doors, in pattern sequence from roll.

M. Apply wall covering to electrical wall plates prior to replacing.

N. Wall covering is required behind fin tube cabinets.

O. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.

P. Install termination trim.

Q. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 09 8430
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing panels.

B. Mounting accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 5100 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023e.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

C. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout.

D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.

E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

G. Manufacturer's qualification statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

PART 2 PRODUCTS

2.01 SOUND-ABSORBING UNITS

A. Manufacturers:
   1. Basis of Design (ACP-1, ACP-2, ACP-3): Duvaltex FRP701 2100 series
   2. LAMVIN: www.lamvin.com/#sle.
   3. Decoustics
   4. Wall Technology, Inc.

5. Quiet Technology Systems

B. General:
   1. Prefinished, factory assembled panels.
   2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

C. Fabric-Covered Acoustical Panels for Walls:
   1. Panel Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
   2. Core Density: 12 to 16 lb/cu ft.
   3. Sound Absorption: Noise Reduction Coefficient (NRC) of 0.85 when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
   4. Panel Size: As Indicated on Drawings.
   5. Panel Thickness: 1 1/2 inches.
   6. Edges: Perimeter edges reinforced by a formulated resin hardener.
   7. Corners: Square.
   8. Fabric: Refer to Interior Finish Schedule.
   9. Color: As selected by Architect from manufacturer's full range.
   10. Mounting Method: Concealed on backside of panel as recommended by manufacturer to support weight of panel.

2.02 FABRICATION

A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
   1. For panels suspended from ceiling, provide fabric covering both sides, with seams only at panel edges.

B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.03 ACCESSORIES

A. Spline-Mounting Accessories: Manufacturer's standard concealed connecting splines of extruded aluminum designed for screw attachment to walls, with coordinating moldings and trim for interior and exterior corners and miscellaneous conditions.
   1. Color of Exposed Trim: As selected from manufacturer's standards.

B. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:
   1. Two-part clip and base-support bracket system; brackets designed to support full weight of panels and clips designed for lateral support, with one part mechanically attached to back of panel and the other attached to substrate.
   2. Metal impaling clips designed to support full weight of panels, mechanically attached to substrate and adhesively bonded to back of panels.
   3. Hook and loop strips adhered to substrate and to back of panels.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Install mounting accessories and supports in accordance with shop drawings.

C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

D. Suspend ceiling baffles at locations and heights as indicated.

E. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
   1. Plumb and level.
   2. Flatness.
   3. Width of joints.

3.03 CLEANING

A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING - K-12 EDUCATION FACILITY GUIDE SPECIFICATION - SHERWIN-WILLIAMS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

B. SSPC-SP 2 - Hand Tool Cleaning; 2024.

C. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

D. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.02 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.
   5. Application methods.
   6. Clean-up information.

C. Samples: Submit four paper draw down samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to manufacturer's label.

1.03 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for general requirements for mock-ups.

B. Provide one accent wall as directed by Architect to demonstrate color and finish.

C. Locate as noted on finish plans.

1.04 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, product name, product code, color designation, VOC content, batch date, environmental handling, surface preparation, application, and use instructions.

C. Paint Materials: Store at a minimum of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

D. Handling: Maintain a clean, dry storage area to prevent contamination or damage to materials.

1.05 FIELD CONDITIONS

A. Do not apply materials when environmental conditions are outside the ranges required by manufacturer.

B. Follow manufacturer's recommended procedures for producing the best results, including testing substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, provide Sherwin-Williams Company (The) products indicated; www.sherwin-williams.com/#sle.

B. Comparable Products: Products of approved manufacturers will be considered in accordance with 01 6000 - Product Requirements, and the following:
   1. Other Acceptable Manufacturers:
      a. PPG Paints as Client Standard.

2.02 PAINTINGS AND COATINGS

A. General:
   1. Provide factory-mixed coatings unless otherwise indicated.
   2. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

C. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.03 PAINT SYSTEMS - EXTERIOR

A. Masonry: Concrete masonry units (CMU), cinder or concrete block.
   1. Latex Systems:
      a. Satin Finish:
         1) 1st Coat: Sherwin-Williams PrepRite Block Filler, B25W25: www.sherwin-williams.com/#sle.
         2) 2nd and 3rd Coat: Sherwin-Williams A-100 Exterior Latex Satin, A82 Series: www.sherwin-williams.com/#sle.
            (a) 4 mils wet, 1.5 mils dry per coat.
   2. Clear Water Repellant:
      a. Clear Finish:
         1) 1st and 2nd Coat: Sherwin-Williams Conflex 7 percent Siloxane Water Repellant, CF31T7: www.sherwin-williams.com/#sle.

B. Metal: Aluminum, galvanized.
   1. Latex Systems:
      a. Semi-Gloss Finish:
         1) 1st and 2nd Coats: Sherwin-Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series: www.sherwin-williams.com/#sle.
            (a) 2 to 4 mils dry per coat.

C. Metal, Miscellaneous: Iron, ornamental iron, structural iron and steel, ferrous metal.
   1. Latex Systems:
      a. Semi-Gloss Finish:
         1) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.
         2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series: www.sherwin-williams.com/#sle.

2.04 PAINT SYSTEMS - INTERIOR

A. Masonry CMU: Concrete, split face, scored, smooth, high density, low density, and fluted.
   1. Latex Systems:
      a. Eg-Shel/Satin Finish High Performance (HP):
         1) 1st Coat: Sherwin-Williams PrepRite Block Filler, B25W25: www.sherwin-williams.com/#sle.

2) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 HP Zero VOC Eg-Shel, B20-1950 Series: www.sherwin-williams.com/#sle.

b. Flat Finish Ceilings only:

1) 1st Coat: Sherwin-Williams PrepRite Block Filler, B25W25: www.sherwin-williams.com/#sle.

2) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 Zero VOC Latex Flat, B30-2600 Series: www.sherwin-williams.com/#sle.

B. Metal: Aluminum and galvanized.

C. Metal, Galvanized: Ceilings and ductwork.

1. Dryfall Waterborne Topcoats:

a. Flat Finish:

1) 1st and 2nd Coat: Sherwin-Williams Pro Industrial Waterborne Acrylic Dryfall, B42-181 Series: www.sherwin-williams.com/#sle.

D. Metal: Structural steel columns, joists, trusses, beams, miscellaneous and ornamental iron, structural iron, and ferrous metal.

1. Latex Systems:

a. Semi-Gloss Finish:

1) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.

2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series: www.sherwin-williams.com/#sle.

E. Drywall: Walls, ceilings, gypsum board, and similar items.

1. Latex Systems:

a. Eg-Shel Finish High Performance (HP):

1) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600: www.sherwin-williams.com/#sle.

2) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 HP Zero VOC Eg-Shel, B20-1950 Series: www.sherwin-williams.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Concrete:

1. Remove release agents, curing compounds, efflorescence, and chalk.
2. Fill bug holes, air pockets, and other voids with cement patching compound.
3. Prepare concrete in accordance with SSPC-SP 13/NACE No.6.

D. Masonry: Remove efflorescence and chalk.

E. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.

F. Concrete Floors and Traffic Surfaces: Prepare concrete in accordance with SSPC-SP 13/NACE No.6.

G. Aluminum: Remove surface contamination and oil; 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. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

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.

C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.

3.04 PRIMING

A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Primers specified in painting schedules may be omitted on items factory primed or factory finished items if acceptable to top coat manufacturers.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 1100
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

B. Section 09 2116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

C. Section 09 2216 - Non-Structural Metal Framing: Concealed supports in metal stud walls.

D. Section 10 2239 - Folding Panel Partitions: Installation of visual display boards on operable partitions.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

1.04 SUBMITTALS

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

B. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard, glass markerboard, tackboard, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

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

B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards:
   1. Manufacturers:
      a. ASI Visual Display Products; _____: www.asi-visualdisplayproducts.com/#sle.
      b. Claridge Products and Equipment, Inc; ____: www.claridgeproducts.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.
   2. Color: White.
   3. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch .
   4. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
   5. Backing: Aluminum foil, laminated to core.
   6. Size: As indicated on drawings.
   7. Frame: Extruded aluminum , with concealed fasteners.
   8. Frame Profile: Top and sides to have 1/2" J-trim.
   9. Frame Finish: Anodized, natural.
   10. Accessories: Provide marker tray and map rail.

2.02 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.

C. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

D. Aluminum Sheet Backing: 27 gauge, 0.014 inch thick.

E. Steel Sheet Backing: 28 gauge, 0.0149 inch, galvanized.

F. Adhesives: Type used by manufacturer.

2.03 ACCESSORIES

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall , full width of frame.

B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

C. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.

D. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

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

B. Secure units level and plumb.

C. Butt Joints: Install with tight hairline joints.

D. Carefully cut holes in boards for wall devices.

E. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.

3.04 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Interior directional and informational signs.

C. Emergency evacuation maps.

D. Building identification signs.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through Architect prior to fabrication.

D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

E. Verification Samples: Submit samples showing colors specified.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.

1.04 QUALITY ASSURANCE

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:

B. Dimensional Letter Signs:

1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
2. Inpro; _____: www.inprocorp.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
1. Sign Type: Flat signs with etched metal panel media as specified.
2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
3. Character Height: 1 inch.
4. Sign Height: 3 inches, unless otherwise indicated or necessary to include content.
5. Office and Classroom Doors: Identify with the room numbers indicated on drawings; in addition, provide two horizontal "window" slots for replacable inserts.
6. Conference and Meeting Rooms: Identify with the room numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
7. Service Rooms: Identify with the room names and numbers indicated on drawings.
8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers indicated on the drawings, and braille.

C. Interior Directional and Informational Signs:
1. Sign Type: Same as room and door signs.

D. Emergency Evacuation Maps:
1. Allow for one map per elevator lobby and one for each classroom and office, printed on paper and framed behind clear acrylic, minimum 8x10, showing building layout and path to exit from that location.
2. Map content to be provided using cad files provided by designer.

E. Building Identification Signs:
1. Use individual metal letters.
2. Mount on outside wall in location indicated on drawings.

2.03 SIGN TYPES

A. Flat Signs: Signage media without frame.
1. Edges: Match existing.
2. Corners: Match existing.
3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica, Arial, or other sans serif font.
2. Character Case: Upper case only.
3. Background Color: to be selected by Architect.
4. Character Color: brushed metal color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
1. Total Thickness: 1/16 inch.

B. Etched Metal Panels:

2.05 DIMENSIONAL LETTERS

A. Metal Letters:
1. Metal: Aluminum casting.
2. Metal Thickness: 1/8 inch minimum.

3. Letter Height: As indicated on drawings.
4. Text and Typeface:
    a. Character Font: Helvetica, Arial, or other sans serif font.
    b. Character Case: Upper case only.
5. Mounting: Concealed screws.

2.06 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Exposed Screws: Stainless steel.

C. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2113.13
METAL TOILET COMPARTMENTS - ASI

ASI - GLOBAL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal toilet compartments.

B. Metal urinal screens.

1.02 REFERENCE STANDARDS

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

B. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings; 2023.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: ASI Accurate Partitions: www.asi-accuratepartitions.com/#sle.

B. Basis of Design Manufacturer: ASI Global Partitions: www.asi-globalpartitions.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.

D. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.02 METAL TOILET COMPARTMENTS

A. Toilet Compartments with Integrated Privacy: Powder-coated steel, sightline blocking molding affixed to hinge and latch sides of door during fabrication. Field-applied, no-sight strips not permitted.
   1. Ultimate Privacy-64; floor-anchored, overhead-braced mounting.

B. Urinal Screens: Powder-coated steel, floor-to-ceiling post.

C. Fabrication:
   1. Fabricate toilet compartment components to sizes indicated.
   2. Coordinate requirements and provide cutouts for through-partition toilet accessories and reinforcement within panel where required for attachment of grab bars.
   3. Provide shoes at pilasters and posts to conceal anchors, supports, and leveling mechanisms.
   4. Provide manufacturer's standard corrosion-resistant supports, leveling mechanisms, anchors, and anchoring assemblies for pilasters and posts.

2.03 COMPONENTS

A. Doors, Panels, and Pilasters: Seamless sheet steel faces, pressure bonded to sound-deadening cellular honeycomb core. Provide doors with integral no-sightline system including integrated privacy component on latch and hinge sides that overlaps adjacent pilasters.
   1. Powder-Coated Steel:
      a. ASI Global Partition Color: As selected from manufacturer's color card.
   2. Panel Faces: 22 gauge, 0.0299 inch.
   3. Door Faces: 22 gauge, 0.0299 inch.
   4. Edge Moldings for Powder-Coated Doors: Integrated sightline continuous roll form 22 gauge, 0.0299 inch.

B. Door and Panel Dimensions:
   1. Thickness: 1 inch.
   2. Ultimate Privacy-64:

a. Door Panel Height: 64 inchesexcept at ADA stalls where panel and doors shall be bottom at 12" a.f.f..
b. Door Height Above Floor: 6" except at ADA stalls where they are 12"a.f.f inches.

3. Urinal/Entrance Screen Panel Height: 48 inches.
4. Urinal/Entrance Screen Panel Height Above Floor: 12 inches.

C. Pilasters: 1-1/4 inch thick, of sizes required to suit compartment width and spacing.
1. Pilaster Height: 84 inches.
2. Pilaster Anchors: Manufacturer's standard stainless steel mounting bars attached to pilaster and secured to building structure.

D. Urinal or Entrance Screen Post: Manufacturer's standard post design of square aluminum tube with satin finish 1-3/4-inch by 1-3/4-inch, with shoe matching that on pilaster.

E. Head Rails: Hollow anodized aluminum tube, 1-inch by 1-5/8-inch size, with anti-grip surface and aluminum wall brackets.

2.04 MATERIALS

A. Steel Sheet: Galvannealed steel sheet, ASTM A653/A653M, with A40/ZF120 coating.

B. Zamac: ASTM B86, commercial zinc-alloy die castings, chrome plated.

2.05 HARDWARE AND ACCESSORIES

A. Brackets:
1. Stirrup Type: Chrome-plated zamac, two per panel connection.

B. Door Hardware: Chrome-plated zamac:
1. Hinges: Wrap-around pivot hinges, gravity type, adjustable for door close positioning; two per door.
2. Latch and Keeper: Surface-mounted ASI integrated privacy slide latch with occupancy indicator and emergency access.
3. Coat Hook: Manufacturer's standard coat hook with rubber bumper; one per compartment, mounted on door.
4. Door Pull: Provide door pull for outswinging doors. Provide on both sides of doors designated as accessible.
5. Door Bumper: Provide rubber-tipped door bumpers at out-swinging doors.

C. Attachments, Screws, and Bolts: Chrome-plated zamac, tamper-resistant type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that field measurements are as indicated.

C. Verify correct spacing of and between plumbing fixtures.

D. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's written instructions.

B. Attach panel brackets securely to walls using anchor devices.

C. Attach panels and pilasters to brackets. Locate head rail joints at pilaster centerlines.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

END OF SECTION

SECTION 10 2239
FOLDING PANEL PARTITIONS

.....

PART 1 GENERAL

3.01 SECTION INCLUDES

A. Top-supported folding panel partitions, horizontal opening.

3.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking and track support shimming.

3.03 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 C1396/C1396M - Standard Specification for Gypsum Board; 2024.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

F. ASTM E413 - Classification for Rating Sound Insulation; 2022.

G. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).

H. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures; 2022.

I. ASTM F793/F793M - Standard Classification of Wall Coverings and Ceiling Coverings by Use Characteristics; 2025.

3.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
   1. Require attendance by representatives of installer.
   2. Notify Architect four calendar days in advance of scheduled meeting date.

3.05 SUBMITTALS

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

B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.

C. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.

D. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.

E. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

F. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.

G. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.

H. Manufacturer's Instructions: Indicate special procedures.

I. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

3.06 QUALITY ASSURANCE

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

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

3.07 DELIVERY, STORAGE, AND HANDLING

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

3.08 WARRANTY

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

B. Correct defective Work within five year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

4.01 MANUFACTURERS

A. Stackinging Panel Partitions - Horizontal Opening:
   1. Kwik-Wall Company; Series 2000 Model 2020 individual panels with model 425 Multi-Directional Aluminum Track and Carrier basis of design: www.kwik-wall.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

4.02 GANGING SINGLE PANEL PARTITIONS - HORIZONTAL OPENING

A. Single Panel Partitions: Side opening; individual panels; side stacking; manually operated, operable bottom seal.

B. Panel Construction:
   1. Frame: Manufacturer's standard thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
   2. Panel Properties:
      a. Thickness With Finish: 3 inches.
      b. Width: Standard width.

C. Panel Finishes:
   1. Facing: Acoustical carpet on Music Classroom with the exception of 4 markerboard panels in the middle of the wall extending from 3'a.f.f. to 7'-0"a.f.f.
   2. Facing: Vinyl coated fabricon Gym side of partition as selected from manufacturer's standard range _____.
   3. Exposed Metal Trim: As selected from manufacturer's standard range.

D. Panel Seals:
   1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
   2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.

E. Suspension System:
   1. Track: Extruded aluminumManufacturer's standard size; thickness and profile designed to support loads.
   2. Carriers: Polymer with bearings wheels on trolley carrier at top of every _____ panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

F. Performance:
   1. Acoustic Performance:
      a. Noise Reduction Coefficient (NRC): ASTM E596, NRC of 0.90 minimum.
      b. Sound Transmission Class (STC): 50 minimum calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
   2. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
   3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

G. Operation:

H. Accessories:
   1. Ceiling Closure: acoustically sealed; aluminum jamb and head molding, fittings and attachments, as recommended by the manufacturer.
   2. Acoustic Sealant: As recommended by partition manufacturer.

4.03 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Standard Gypsum Board: ASTM C1396/C1396M, 3/8 inch thick, maximum permissible length; ends square cut, square edges.

C. Vinyl Coated Fabric: ASTM F793 Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.

D. Acoustical Carpet: Manufacturer's standard type, _____ color.

E. Acoustic Insulation:
   1. Type: As required for acoustic performance indicated.
   2. Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

5.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that required utilities are available, of the correct characteristics, in proper location, and ready for use.

C. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.

D. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

E. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

5.02 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.

B. Install electric operator, wiring, and controls. Locate control station(s) as indicated.

C. Fit and align partition assembly and pocket doors level and plumb.

D. Lubricate moving components.

E. Install acoustic sealant to achieve required acoustic performance.

F. Coordinate electrical connections.

5.03 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C. Adjust partition assembly to achieve lightproof seal.

5.04 CLEANING

A. Clean finish surfaces and partition accessories.

B. Condition markerboard surfaces in accordance with manufacturer's instructions.

5.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Corner guards fabricated from rolled metal sections or bent plate.

B. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.

C. Section 09 2116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

D. Section 09 2216 - Non-Structural Metal Framing: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2024.

B. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2023.

1.04 SUBMITTALS

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

B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.

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

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Stock Materials: One package(s) of minimum 96 inches long unit of each kind of covers for corner guards.

E. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

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

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Basis of Design: Pawling; Type 304, Model No. CG-51
   2. Babcock-Davis: www.babcockdavis.com/#sle.
   3. Construction Specialties, Inc; Heavy Duty Corner Guards: www.c-sgroup.com/#sle.
   4. Inpro: www.inprocorp.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

2.03 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Material: Type 304 stainless steel, 6 finish, 0.0625 inch thick.
   2. Width of Wings: 2 inches.
   3. Corner: Radiused.
   4. Color: As selected from manufacturer's standard colors.
   5. Length: One piece.
   6. Preformed end caps.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.05 SOURCE QUALITY CONTROL

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

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. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to 60 inches high.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Electric hand/hair dryers.

E. Diaper changing stations.

F. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 10 2113.13 - Metal Toilet Compartments.

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; 2024.

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

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

E. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings; 2023.

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 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. American Specialties, Inc: www.americanspecialties.com/#sle.
   2. Bradley Corporation: www.bradleycorp.com/#sle.
   3. Bobrick Washroom Equipment, Co., Inc..
   4. Substitutions: Section 01 6000 - Product Requirements.

B. Electric Hand/Hair Dryers:
   1. American Specialties, Inc: www.americanspecialties.com/#sle.

2. Substitutions: Section 01 6000 - Product Requirements.

C. Diaper Changing Stations:
1. Koala Kare Products: www.koalabear.com/#sle.
2. Substitutions: 01 6000 - Product Requirements.

D. 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 2 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. Zinc Alloy: Die cast, ASTM B86.

G. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

H. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

I. Adhesive: Two component epoxy type, waterproof.

J. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

K. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Size: As indicated on drawings.
3. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
5. Products:
a. Substitutions: Section 01 6000 - Product Requirements.

B. Grab Bars: Stainless steel, peened surface.
1. Standard Duty Grab Bars:
a. Push/Pull Point Load: 250 pound-force, minimum.
b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
c. Finish: Satin.
d. Length and Configuration: As indicated on drawings.
e. Products:
1) Bobrick B-5897.
2) Substitutions: Section 01 6000 - Product Requirements.

C. Combination Sanitary Napkin/Tampon Dispenser with Disposal: Stainless steel, surface-mounted.

1. Products:
    a. Bobrick B-282-25.
    b. Substitutions: Section 01 6000 - Product Requirements.

D. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
    a. Bobrick B-354.
    b. Substitutions: Section 01 6000 - Product Requirements.
    c. Finish: Satin.
    d. Products:
        1) Bobrick B-5806 Series.
        2) Bobrick B-4998.99 Wall Mounted Swing Up.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.
1. Products:
    a. Bobrick B-207 Series.
    b. Substitutions: Section 01 6000 - Product Requirements.

B. Shower Curtain:
1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Size: 36 by 72 inches, hemmed edges.
3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
4. Color: White.

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 and L-shaped, left hand seat.
1. Size: ADA Standards compliant.
2. Products:
    a. Bobrick B-5181.
    b. Substitutions: Section 01 6000 - Product Requirements.

D. Towel Pin: Stainless steel, 3 inch extension from wall; rectangular-shaped bracket and backplate for concealed attachment, satin finish.

2.06 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Color: White.

2.07 ELECTRIC HAND/HAIR DRYERS

A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
1. Operation: Automatic, sensor-operated on and off.
2. Mounting: Wall-mounted - surface.
3. Cover: Plastic.
    a. Color: Stainless Steel..
    b. Tamper-resistant screw attachment of cover to mounting plate.
4. Air Velocity: 15,000 linear feet per minute, minimum.
5. Supply Voltage: As indicated on drawings.
6. Warranty: 3 years.

7. Electric Hand Dryer Products:
    a. Excel Dryer Inc; XLERATOR: www.exceldryer.com/#sle.
    b. World Dryer Corporation; VERDEdri: www.worlddryer.com/#sle.
    c. Dyson Airblade V-HU02 .
    d. Substitutions: Section 01 6000 - Product Requirements.

2.08 DIAPER CHANGING STATIONS

A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
    1. Material: Stainless steel.
    2. Mounting: Recessed.
    3. Color: As selected.
    4. Minimum Rated Load: 250 pounds.
    5. Products:
        a. Saniflow Hand Dryer Corporation; Babymedi Horizontal: www.saniflowcorp.com/#sle.
        b. Koala Corporation KB 100 Horizontal.
        c. Substitutions: 01 6000 - Product Requirements.

2.09 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
    1. Drying rod: Stainless steel, 1/4 inch diameter.
    2. Hooks: Three, 0.06 inch stainless steel rag hooks at shelf front.
    3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
    4. Length: 36 inches.
    5. Products:
        a. Bobrick B-223.
        b. Substitutions: 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. 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

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking.

B. Section 09 9123 - Interior Painting.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

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

1.04 SUBMITTALS

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

B. Product Data: Provide extinguisher operational features.

C. Manufacturer's Instructions: Indicate special criteria and wall opening coordination requirements.

D. Operation and Maintenance Data: Include test, refill, or recharge schedules and recertification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature causes freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
   2. Ansul, a Tyco Business: www.ansul.com/#sle.
   3. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.

B. Fire Extinguisher Cabinets and Accessories:
   1. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   2. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
   3. Oval Brand Fire Products; Cabinets for Low Profile Extinguishers: www.ovalfireproducts.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. General Requirements: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) for purpose specified and as indicated.

B. Multipurpose Dry-Chemical-Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Cartridge Operated: Spun shell.
   2. Class: A:B:C.
   3. Size: 30 lb.
   4. Temperature range: Minus 65 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-fire rated.

1. Formed primed steel sheet; 20-gauge, 0.036-inch thick base metal.

B. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.

C. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

D. Fabrication: Weld, fill, and grind components smooth.

E. Finish of Cabinet Exterior Trim and Door: Primed for field paint finish.
   1. See Section 09 9123 for field painting.

F. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Lettering: FIRE EXTINGUISHER text on decal or self-adhesive vinyl, prespaced black lettering in accordance with authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.

C. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.

D. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, at a height from finished floor to comply with applicable code.

END OF SECTION

SECTION 10 7500
FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete base and foundation construction.

B. Section 31 2323 - Fill: Sand to fill foundation tube sleeve.

1.03 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; 2024.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

C. ASTM A312/A312M - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes; 2025.

D. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.

E. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

1.04 SUBMITTALS

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

B. Product Data: Provide data on pole, accessories, and configurations.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. Concord American Flagpole; External - Continental: www.concordamericanflagpole.com/#sle.
   2. Pole-Tech Co, Inc: www.poletech.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001
   1. Material: Aluminum.
   2. Mounting: Ground mounted type.
   3. Outside Butt Diameter: 6 inches.
   4. Nominal Height: 30 ft; measured from nominal ground elevation.

2.03 POLE MATERIALS

A. Aluminum: ASTM B241/B241M , 6063 alloy , T6 temper.

B. Steel: ASTM A53/A53M Type S, Grade B.

C. Stainless Steel: ASTM A312/A312M TP304 grade.

2.04 ACCESSORIES

A. Solar Flag Pole Light: Enrybia Commercial Solar Flag Pole Light or approved equal.

B. Cleats: 9 inch size, aluminum with galvanized steel fastenings, one per halyard.

C. Cleat Box: Aluminum, with built-in hinge and hasp assembly, attached to pole with tamper proof screws inside box.

D. Halyard: 5/16 inch diameter nylon, braided, white.

E. Connecting Sleeve For Multiple Section Poles: Same material as pole, precision fit for field assembly of pole, concealed fasteners.

2.05 OPERATORS

A. Hand Crank: Removable type.

2.06 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth of as indicated.

B. Pole Base Attachment: Flush; steel base with base cover.

2.07 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Aluminum: manufacturer's standard clear anodized..

C. Finial: Gold anodized finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

B. Fill foundation tube sleeve with concrete specified in Section 03 3000.

C. Set brackets for wall set flagpoles anchored securely into wall construction. Seal watertight.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 11 6623
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basketball backboards, goals, and support framing.

B. Floor sleeves for net and goal posts.

C. Wall mounted protection pads.

D. Gym divider curtains.

E. Volleyball nets and posts.

1.02 RELATED REQUIREMENTS

A. Section 26 0583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Fire rating certifications.
   3. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

D. Erection Drawings: Detailed dimensional requirements for proper location of equipment.

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.07 WARRANTY

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gymnasium Equipment:
   1. Draper, Inc; _____: www.draperinc.com/#sle.
   2. IPI by Bison, Inc; _____: www.ipibybison.com/#sle.
   3. Performance Sports Systems; _____: www.perfsports.com/#sle.
   4. Porter Athletic Equipment Company; _____: www.porterathletic.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. See drawings for sizes and locations, unless noted otherwise.

B. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

C. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

D. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

E. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 GYMNASIUM DIVIDER CURTAINS

A. Gymnasium Divider Curtains:
   1. Curtain Material: Class A rated, self-extinguishing vinyl coated polyester complying with NFPA 701.
   2. Upper Section: 9 oz/sq yd vinyl mesh fabric.
   3. Lower Section: 18 oz/sq yd solid vinyl coated polyester.
   4. Operation: Vertical lift roll-up, curtain coils on bottom rail .
   5. Controls: Wireless remote.
   6. Width: As indicated on drawings.
   7. Manufacturers:
      a. Draper, Inc; Top Roll Divider Curtain (basis of design): www.draperinc.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 BASKETBALL

A. Basketball System: Backstop assembly, backboard, and goal.
   1. Manufacturers:
      a. ADP Lemco, Inc; _____: www.adplemco.com/#sle.
      b. Draper, Inc; _____: www.draperinc.com/#sle.
      c. IPI by Bison, Inc; _____: www.ipibybison.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
   1. Framing: Center strut; forward folding framing.
   2. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
   3. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
      a. Height Control System: Electric hoist that adjusts backstop with 115 volt actuator, and integral limit switches that provide automatic shut-off in both positions.
   4. Framing Color: Manufacturer's standard.
   5. Manufacturers:
      a. Draper, Inc; _____: www.draperinc.com/#sle.

b. IPI by Bison, Inc; IP1360FF Forward Fold, Front Braced: www.ipibybison.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

C. Backboards: Tempered glass, rectangular shaped.
1. Frame: Brushed aluminum edge, steel mounting.
2. Markings: Painted.
3. Color: Manufacturer's standard.

D. Goals: Steel rim, mounted to backboard, with attached nylon net; complete with mounting hardware.
1. Net Attachment Device: Tube-tie.
2. Finish: Powder coat orange.

2.05 FLOOR-MOUNTED EQUIPMENT

A. Volley Ball Nets and Posts: One court system of adjustable posts, net, and tensioning winch meeting requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
1. Posts: 3-1/2 inch O.D. schedule 80 aluminum tube with 1 inch height adjustments between 42 and 96 inches.
2. Net: 4 inch square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
3. Tensioning Winch: Manual crank heavy duty, self-locking worm gear mechanism.
4. Protective Pads: Polyethylene foam covered with polyester reinforced vinyl fabric.
a. Size: 2'x6'.
b. Color: As selected from manufacturer's standard range.
5. Manufacturers:
a. Draper, Inc; _____: www.draperinc.com/#sle.
b. IPI by Bison, Inc; VB1000NS Centerline Aluminum: www.ipibybison.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

B. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for nets and goals; installed flush with finish floor surface.
1. Latch Cover: Brass, round; tamper resistant lock with key.
2. Sleeve: Aluminum.
3. Depth of Sleeve: 9 inches from floor surface to bottom, including latch cover.

2.06 WALL PADDING

A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
2. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
a. Color: As selected from manufacturer's standard range.
b. Texture: Embossed leather-look.
c. Fabric Weight: 14 oz/sq yd, minimum.
3. Foam, Fire-Rated: Open cell polychloroprene (Neoprene), with 5.5 pcf nominal density.
4. Foam Thickness: 1-1/2 inches.
5. Backing Board: Plywood.
6. Panel Dimensions: 24 inches wide by 72 inches long, including nailing/fastening margins.
7. Manufacturers:
a. ADP Lemco, Inc; _____: www.adplemco.com/#sle.
b. Draper, Inc; _____: www.draperinc.com/#sle.
c. Grand Slam Safety, LLC; Wall Padding: www.grandslamsafety.com/#sle.
d. IPI by Bison, Inc; Indoor Solid Color Vinyl Padding: www.ipibybison.com/#sle.
e. Substitutions: See Section 01 6000 - Product Requirements.

B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:
   1. Stage corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.

C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level.

D. Secure equipment with manufacturer's recommended anchoring devices.

E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

F. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

END OF SECTION

SECTION 11 8129
FACILITY FALL PROTECTION

PART 2 PRODUCTS

END OF SECTION

SECTION 12 2400
ROLLER WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Window shades and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 09 2116 - Gypsum Board Assemblies: Substrate for window shade systems.

C. Section 09 5100 - Acoustical Ceilings: Shade Pockets, pocket closures and accessories.

1.03 REFERENCE STANDARDS

A. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2019.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
   2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.

B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of all affected installers.

C. 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 01 3300 - Submittal Proceduers, for submittal process.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details.

D. Shop Drawings - Motorized Shades: Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.

E. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

F. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

G. Selection Samples: Include fabric samples in full range of available colors and patterns.
   1. Motorized Shades: Include finish selections for controls.

H. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

I. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

K. 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 five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience.
   1. Factory training and demonstrated experience.

1.07 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.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

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

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: One year.
   2. Fabric: One year.
   3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manually Operated Roller Shades: At all exterior windows where indicated on the Drawings.
   1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
   2. Basis of Design: SWFcontract, a division of Springs Window Fashions, LLC.; _____: www.swfcontract.com/#sle.
   3. MechoShade Systems, Inc..
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 WINDOW SHADE APPLICATIONS

A. Refer to plans for shade types and locations.
   1. Type: Single Roller Shade
      a. Basis of Design Fabric: As indicated in Finish Key
      b. Color: As indicated in Finish Key, or as selected by Architect from manufacturer's full range of colors.
      c. Mounting: Per details in Drawings.
      d. Operation: Manual, Refer to Drawings for Locations.

2.03 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
   1. Bead Chains: Nickel-plated metal.
      a. Loop Length: Extend to within 36 inches above finished floor.

b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Chain tensioner, sill-mounted or mounted on vertical window mullion, as applicable.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
   a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Roller Drive-End Location: Right side of inside face of shade, unless otherwise indicated on Drawings.
   2. Direction of Shadeband Roll: Regular, from back of roller.
   3. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:
   1. Shadeband Material: Light-filtering fabric.
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.

E. Installation Accessories:
   1. Wall-Mount Angle Support Angles: Manufacturer's standard design for support of concealed roller window shade operating mechanism to be installed above finish ceiling as indicated on the Drawings.

2.04 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Black-out Shade Fabric: 100% polyester fabric with acrylic foamed coating and anti-microbial finish.

C. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
   1. Source: Roller-shade manufacturer.
   2. Type: PVC-coated polyester, unless otherwise indicated in the Drawing “FINISH KEY.”
   3. Roll Width: Maximum available by manufacturer, but not less than 84 inches.
   4. Openness Factor: 3 percent, unless otherwise indicated in the Drawing “FINISH KEY.”
   5. Colors: As selected from Manufacturer's Full Range

2.05 MOTOR CONTROLS

A. Motorized shades, where indicated, to be controlled by wall-mounted controls as specified below.

B. Control Requirements:
   1. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.
   2. Capable of controlling shade speed for tracking within plus or minus 0.125 inch throughout entire travel.
   3. Capable of stopping within accuracy of 0.125 inch at any point between open and close limits.
   4. Capable of assigning shades to groups and subgroups without rewiring.

5. Provide 10 year power failure memory for preset stops, open and close limits, shade grouping and subgrouping and system configuration.
6. Capable of synchronizing multiple units of the same size to start, stop and move in unison.
7. Provide all components and connections necessary to interface with other systems as indicated.

C. Wall-Mounted Controls: UV stabilized visible parts meeting ASTM D4674; provided by shade manufacturer.
   1. Control Functions:
      a. Open: Automatically open controlled shade(s) to fully open position when button is pressed.
      b. Close: Automatically close controlled shade(s) to fully closed position when button is pressed.
   2. Finish: To be selected by Architect.
   3. Button Engraving: Manufacturer's standard engraving, unless otherwise indicated.

2.06 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 be selected by Designer from shade manufacturer's full range.

B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

C. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.07 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 1/2 inch space between bottom bar and window stool.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. 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. Maximum Offset From Level: 1/16 inch.

C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

D. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 SYSTEM STARTUP

A. Motorized Shade System: Provide services of a manufacturer's authorized representative to perform system startup.

3.05 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

D. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.07 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 3200
MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: VOC limitations for adhesives and sealants.

1.02 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

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

D. AWI (QCP) - Quality Certification Program; Current Edition.

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. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

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

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.

C. Maintenance Data: Manufacturer's recommendations for care and cleaning.

D. Finish touch-up kit for each type and color of materials provided.

1.05 QUALITY ASSURANCE

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

B. Manufacturer shall comply with AWI (QCP) woodwork association in accordance with requirements for work specified in this section.
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. This AWI (QCP) project to be registered with a project number.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
   5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

6. Replace, repair, or rework all work for which certification is refused.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:
   1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:
   1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Laminate Casework:
   1. Case Systems: www.casesystems.com/#sle.
   2. AMD Cabinets
   3. Associated Construction Enterprises, Inc.
   4. European Techniques
   5. Sun Valley Millwork, Inc.
   6. TMI Systems Design Corporation
   7. Form A Fab
   8. Troyer

2.02 CASEWORK, GENERAL

A. Quality Standard: AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom Grade or better.

2.03 FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Construction: As required for selected grade.

C. Structural Performance: Safely support the following minimum loads:
   1. Base Units: 500 pounds per linear foot across the cabinet ends.
   2. Suspended Units: 300 pounds static load.
   3. Drawers: 125 pounds, minimum.
   4. Hanging Wall Cases: 300 pounds.
   5. Shelves: 100 pounds, minimum.

D. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.

E. Hardware Application: Factory-machine casework members for hardware that is not surface applied.

F. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.

G. Fixed panels at backs of open spaces between base cabinets.

H. Edging: Fit shelves, 1mm all 4 sides, doors,3mm, and exposed edges with 3mm edgebanding. Do not use more than one piece for any single length.

I. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

J. Matching Wood Grain: Comply with requirements of quality standard for specified grade and as follows:
   1. Provide sequence matching across each elevation.

K. Apron Frames: Construction similar to other cabinets, with modifications.

2.04 PLASTIC-LAMINATE-CLAD CASEWORK

A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base and tall cabinets.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
   2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
      a. Base Cabinets: 24 inches.
      b. Tall Cabinets: 24 inches.
      c. Wall Cabinets: 14 inches.
   3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
      a. Finish: Matte or suede, gloss rating of 5 to 20.
      b. Surface Color and Pattern: As selected by Architect from manufacturer's full line.
      c. Exposed Surfaces: Plastic Laminate
      d. Semi Exposed Surfaces: Thermally fused laminate
      e. 1) Color: Color as selected by Architect.
      f. Concealed Surfaces: Thermally fused laminate.
         1) Color: White.
      g. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
         1) Matching Wood Grain Pattern: Comply with requirements of quality standard for specified grade and as follows:
            (a) Provide sequence matching across each elevation.
            (b) Carry figure of cabinet fronts to toe kicks.
      h. Cap exposed plastic laminate finish edges with 3mm material of same finish and pattern.

2.05 COUNTERTOPS

A. Types: More than one type is required. See drawings for location of each type of countertop.

B. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade, unless otherwise noted.

C. Stainless Steel Countertops: Manufacturer's standard alloy and gauge.
   1. Manufacturer's standard configuration for exposed edges, back and end splashes.

D. Plastic Laminate Countertops: High pressure decorative laminate sheet bonded to substrate.
   1. Manufacturer's standard configuration for exposed edges, back and end splashes.
   2. Custom configuration for exposed edges, back and end splashes, with details indicated on drawings.

E. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Refer to Interior Finish Schedule for Basis of Design manufacturer and product.
   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.

3. Fabricate in accordance with manufacturer's standard requirements.

2.06 SPECIAL PURPOSE UNITS

A. Education Special Units.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
   2. Primary Construction: Plastic-laminate clad units, with manufacturer's standard material countertops.
      a. Cabinet Hardware: Manufacturer's standard, types as required for drawers, doors, shelves, levelers and similar items.
      b. Finish, Surface Color and Pattern: As indicated on drawings.
   3. Cubicle Storage Units: Sizes and configurations indicated on drawings.
      a. Open Storage.

B. Musical Instrument Storage Special Units.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
   2. Primary Construction: Plastic-laminate clad units.
      a. Cabinet Hardware: Manufacturer's standard, types as required for drawers, doors, shelves, levelers and similar items.
      b. Finish, Surface Color and Pattern: As indicated on drawings.
      c. Finish, Surface Color and Pattern: As selected by Architect from manufacturer's standard line.
   3. Large and Small Instrument Storage Units: Manufacturer's standard; sizes and configurations indicated on drawings.

C. Mailroom Special Units.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
   2. Primary Construction: Plastic-laminate clad units, with manufacturer's standard material countertops.
      a. Finish, Surface Color and Pattern: As indicated on drawings.
   3. Mail Slot Units: Manufacturer's standard units; sizes and configurations indicated on drawings.

2.07 CABINET HARDWARE

A. Manufacturer's standard types, styles and finishes, and as indicated below.

B. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.
   1. Hinged Doors: Cam type lock, satin chromium plated over nickel on base material.
   2. Tall Hinged Doors: Three-point latching system.
   3. Keying: Key locks as directed.

C. Shelves in Cabinets:
   1. Shelf Standards and Rests: 3 pin, 5mm plastic shelf clip.

D. Swinging Doors: Hinges, pulls, and catches.
   1. 5 knuckle Hinges: Visible, number as required by referenced standards for width, height, and weight of door.
      a. Visible Hinges: Installed on framed cabinet face, and on door face, bright chromium plated over nickel on base material.
   2. Pulls: Brushed Chrome wire pulls, 4 inches wide.
   3. Catches: Magnetic.

E. Drawers: Pulls and slides.
   1. Pulls: Chrome wire pulls, 4 inches wide.
   2. Slides: Accuride or equal Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.08 MATERIALS

A. Adhesives Used for Assembly: Comply with VOC requirements for adhesives and sealants; see Section 01 6116.

B. Wood-Based Materials:
   1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
   2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

C. Hardboard: ANSI A135.4, Class 1, tempered.

D. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications. complying with Grade requirements, and standard with the manufacturer.

E. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.

F. Stainless Steel Sheet: ASTM A666/A666M Type 304.

2.09 ACCESSORIES

A. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; of width to match component thickness.
   1. Color: As selected by Architect from manufacturer's standard range.
   2. Color: As shown on drawings.
   3. Use at exposed edges.
   4. Use at exposed shelf edges.

B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; chrome-plated finish in concealed locations and chrome-plated finish in exposed locations.

C. Concealed Joint Fasteners, dowels or splines, no staples: Corrosion-resistant, standard with manufacturer.

D. Grommets: Standard plastic grommets for cut-outs, in color black.

E. Sealant for Use in Casework Installation:
   1. One component, clear silicone base sealant, chemical curing complying with ASTM C920, Type S, Grade NS, Class 25, Use NT, when tested to glass and aluminum, anti-fungus composition.

PART 3 EXECUTION

3.01 PREPARATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

A. Site Verification of Environmental Conditions:
   1. Do not deliver casework until the following conditions have been met:
      a. Building has been enclosed (windows and doors sealed and weather-tight).
      b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
      c. Ceiling, overhead ductwork, piping, and lighting have been installed.
      d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
   1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inchper story.

2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.

D. Verify adequacy of support framing and anchors.

E. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Secure wall and floor cabinets to concealed reinforcement at gypsum board assemblies.

G. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches on center, and at sides of cabinets with not less than two fasteners per side.

H. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.

I. Install hardware uniformly and precisely.

J. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

K. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.06 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 14 2400
HYDRAULIC ELEVATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Complete hydraulic elevator systems.
   1. Passenger type.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Includes elevator machine foundation, enclosed hoistway, elevator pit, divider beams, overhead hoist beams, grouting thresholds, and grouting hoistway entrance frames.

B. Section 04 2000 - Unit Masonry: Masonry hoistway enclosure; building-in and grouting hoistway door frames.

C. Section 05 5000 - Metal Fabrications: Includes elevator pit ladder, sill supports, divider beams, and overhead hoist beams.

D. Section 07 8400 - Firestopping: Fire rated sealant in hoistway.

E. Section 08 3100 - Access Doors and Panels: Fire rated access doors into hoistway.

F. Section 09 2116 - Gypsum Board Assemblies: Gypsum shaft walls.

G. Section 09 6500 - Resilient Flooring: Floor finish in car.

H. Section 09 6813 - Tile Carpeting: Floor finish in car.

I. Section 09 6816 - Sheet Carpeting: Floor finish in car.

J. Section 09 9123 - Interior Painting: Field painting of hoistway entrance doors and frames.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. AISC 360 - Specification for Structural Steel Buildings; 2022, with Errata (2025).

D. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

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

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

K. PS 1 - Structural Plywood; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other installers to provide conduits necessary for installation of wiring including but not limited to:

PART 2 PRODUCTS

2.01 HYDRAULIC ELEVATORS

2.02 COMPONENTS

2.03 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, authorities having jurisdiction (AHJ), and _____.

B. Accessibility Requirements: Comply with ADA Standards.

C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.

D. Perform welding of steel in accordance with AWS D1.1/D1.1M.

E. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.

F. Perform electrical work in accordance with NFPA 70.

2.04 OPERATION CONTROLS

A. Elevator Controls: Provide landing operating panels, landing indicator panels, and _____.
   1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
   2. Landing Indicator Panels: Illuminating.
   3. Comply with ADA Standards for elevator controls.

B. Interconnect elevator control system with building security, fire alarm, card access, smoke alarm, building management control, and _____ systems.

C. Door Operation Controls:
   1. Program door control to open doors automatically when car arrives at floor landing.
   2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
   3. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.

2.05 OPERATION CONTROL TYPE

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.

B. Plywood: PS 1, Structural I, Grade C-D or better, sanded.

C. Carpet Flooring: See Section 09 6816, Type ___.

D. Plastic Laminate: NEMA LD 3, Type HGS, color as selected by Architect from manufacturer's standard line of colors.

2.07 CAR AND HOISTWAY ENTRANCES

A. Elevator, No. ___:
   1. Car and Hoistway Entrances, Main Elevator Lobby:
      a. Framed Opening Finish and Material: Alkyd enamel on steel.
      b. Car Door Material: Powder coat on steel, with rigid sandwich panel construction.
      c. Hoistway Door Material: Powder coat on steel, with rigid sandwich panel construction.

2.08 CAR EQUIPMENT AND MATERIALS

A. Elevator Car, No. ___:
   1. Car Operating Panel: Provide main and auxiliary; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, alarm button, and _____.

a. Panel Material: Integral with front return; one per car.
b. Car Floor Position Indicator: Above door with illuminating position indicators.
c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch above car finished floor.

2. Flooring: Carpeting.
3. Front Return Panel: Match material of car door.
4. Door Wall: Plastic laminate on plywood.
5. Hand Rail: Aluminum, at all three sides. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
   a. Aluminum Finish: Clear anodized.
6. Ceiling:

2.09 FINISHES

A. Powder Coat on Steel: Clean and degrease metal surface; apply one coat of primer; two coats of powder coat.

B. Finish Paint for Metal Surfaces: Alkyd enamel, semi-gloss, color as selected, complying with VOC limitations of authorities having jurisdiction (AHJ).

C. Clear Anodized Finish: Class I, AAMA 611 AA-M12C22A41, clear anodic coating with electrolytically deposited organic seal; not less than 0.7 mil, 0.0007 inch thick.

END OF SECTION

SECTION 31 1000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and grubbing.

B. Selective removal and trimming.

C. Debris removal.

1.02 RELATED REQUIREMENTS

A. Section 02 4100 - Demolition: Removal of built elements and utilities.

PART 3 EXECUTION

2.01 EXAMINATION

A. Comply with additional requirements specified in Section 01 7000 - Execution and Closeout Requirements.

2.02 PREPARATION

A. Coordinate work with utility companies; notify before starting work and comply with local requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are to remain.

2.03 CLEARING AND GRUBBING

A. Clearing: Cut trees, stumps, shrubs, downed timber, and other vegetation for removal within identified area as indicated on drawings according to 29 CFR 1910.266. Follow recommendations of ANSI Z133 and best local practices for species involved.

B. Do not remove or damage vegetation beyond limits indicated on drawings.

C. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum subsoil disturbance.

2.04 SELECTIVE REMOVAL AND TRIMMING

A. Selective Removal: Individual tree and shrub identified for removal as indicated on drawings according to 29 CFR 1910.266.

B. Selective Trimming: Individual limbs and branches cut back according to ANSI A300 Part 1 identified for removal as indicated on drawings. Follow recommendations of ANSI Z133 and best local practices for species involved.

2.05 REMOVED VEGETATION PROCESSING

A. Do not burn, bury, landfill, or leave on-site, except as indicated on drawings.

B. Trees: Sell if marketable.

2.06 DEBRIS REMOVAL

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

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

C. Clean up spillage and windblown debris from public and private lands.

END OF SECTION

SECTION 31 2200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal and storage of topsoil.

B. Rough grading the site for site structures.

C. Fine grading.

D. Finish grading for planting.

1.02 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravel: Excavated on-site.
   1. Graded according to ASTM D2487 Group Symbol GW, GP, or SP.

B. Topsoil: Complying with State of Arizona, ADEQ SRL standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify survey bench mark and intended elevations for grading areas are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Provide temporary means and methods to remove standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to bench marks, survey control points, and fences.

3.03 ROUGH GRADING

A. Excavate and fill subgrade material to elevations indicated on plans.

B. Replace displaced subgrade in accordance with Section 31 2323.

C. Remove and replace unsuitable materials as specified fill.

3.04 FINE GRADING

A. Scrape and spread subgrade material uniformly smooth and without disruptions as indicated on drawings.

3.05 FIELD QUALITY CONTROL

A. Pending report

3.06 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.

C. Leave site clean and raked, ready to receive work.

END OF SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.

B. Support and protection.

C. Excavation.

1.02 RELATED REQUIREMENTS

A. Section 02 4100 - Demolition.

B. Section 31 1000 - Site Clearing.

C. Section 31 2200 - Grading.

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

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

B. Delegated Design Documents: Support and protection plan drawings and calculations sealed by designer.

C. Field Quality Control Submittals: Document visual inspection of loadbearing excavated surfaces.

1.05 QUALITY ASSURANCE

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify survey bench mark elevations are as indicated on drawings.

B. Survey existing adjacent structures and exterior improvements to establish exact elevations at fixed points for bench marking.

2.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate and identify known utilities to remain and protect from damage.

C. Notify utility company to remove and relocate utilities.

2.03 SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.

2.04 EXCAVATION

A. General Excavation:
   1. Excavate to indicated contours, elevations, and grades.

B. Excavation to accommodate foundations, underground tanks, and underground utilities.
   1. Excavate to specified elevations.
   2. Over-excavate to safely install, adjust, and remove forms, bracing, or supports necessary for installation of work.

C. Notify Architect of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

D. Do not interfere with 45-degree bearing splay of foundations.

2.05 FIELD QUALITY CONTROL

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

B. Provide access for visual inspection of loadbearing excavated surfaces by Architect before proceeding with work.

C. Resurvey existing adjacent structure and exterior improvement bench marks. Notify Architect of changes in elevations, positions, or slopes.

2.06 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Stockpile excavated material for re-use in area designated on-site; see Section 31 2200.

C. Remove excavated material unsuitable for re-use from site.

D. Remove excess excavated material from site.

2.07 PROTECTION

A. Divert surface water away from excavations.

B. Maintain stability of banks and loose soils; prevent from falling into excavations.

C. Maintain excavations in satisfactory, undisturbed condition.

D. Protect bottom of excavations from freezing.

END OF SECTION

SECTION 31 2316.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 DEFINITIONS

1.03 SUBMITTALS

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

B. Source Quality Control Submittals: Submit name of imported materials source.
   1. Results of gradation tests on proposed and actual materials used.

C. Compaction Density Test Reports.

1.04 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver fill to project site in advance of need.

C. When fill materials need on-site storage, locate stockpiles where indicated on drawings.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

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

B. Test fill materials in accordance with specified standard before delivery to site.

C. Nonconforming Materials: Change and retest.

D. Provide materials of each type from same source or as directed by Architect.

SECTION 31 2323
FILL

PART 3 EXECUTION

1.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Verify areas to be filled are not compromised with surface or ground water.

1.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

1.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:

H. Reshape and re-compact fills subjected to vehicular traffic.

I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

1.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

1.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Soil Fill Materials:
   1. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
   2. If tests indicate work does not meet specified requirements, remove work, replace and retest.
   3. Frequency of Tests: TBD.

1.06 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 3116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Soil-applied chemical treatment.

B. Site-applied termiticide for wood, steel, and concrete.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading.

1.03 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2022.

1.04 SUBMITTALS

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

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Manufacturer's Instructions: Indicate caution requirement.

E. Executed warranty.

1.05 QUALITY ASSURANCE

1.06 WARRANTY

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

B. Provide five year installer's warranty against damage to building caused by termites.
   1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.
   2. Inspect annually and report in writing to Owner. Provide inspection service for 5 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

2.02 CHEMICAL SOIL TREATMENT

A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.

B. Diluent: Recommended by toxicant manufacturer.

C. Manufacturers:
   1. Bayer Environmental Science Corp: www.backedbybayer.com/pest-management/#sle.Bayer Environmental Science Corp: www.backedbybayer.com/pest-management/#sle.Bayer Environmental Science Corp: www.backedbybayer.com/pest-management/#sle.
   2. FMC Professional Solutions: www.fmcprosolutions.com/#sle.
   3. Syngenta Professional Products: www.syngentaprofessionalproducts.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

D. Mixes: Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify final grading is complete; see Section 31 2200.

B. Verify utility trenches are wide enough to receive application.

3.02 APPLICATION

A. Comply with manufacturer's written instructions.

3.03 APPLICATION - CHEMICAL TREATMENT

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray apply toxicant in accordance with manufacturer's instructions.

C. Apply toxicant at following locations:
   1. Under Slabs-on-Grade.
   2. At Both Sides of Foundation Surface.
   3. Soil Within 10 feet of Building Perimeter For a Depth recommended by Manufacturer.

D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.

E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

G. Re-treat disturbed treated soil with same toxicant as original treatment.

H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.04 PROTECTION

A. Do not permit soil grading over treated work.

B. Protect applications from damage after completion. Repair disturbances according to manufacturer's written instructions.

END OF SECTION

SECTION 32 1216
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Single course bituminous concrete paving.

C. Double course bituminous concrete paving.

D. Surface sealer.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of site for paving and base.

B. Section 31 2323 - Fill: Compacted subgrade for paving.

C. Section 32 1313 - Concrete Paving: Concrete substrate.

D. Section 32 1713 - Parking Bumpers: Concrete bumpers.

1.03 REFERENCE STANDARDS

A. AI MS-2 - Asphalt Mix Design Methods; 2015.

B. AI MS-19 - Basic Asphalt Emulsion Manual; 2008.

C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with the authority having jurisdiction.

B. Mixing Plant: Complying with local municipal authority standards.

C. Obtain materials from same source throughout.

1.05 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable code for paving work on public property.

2.02 MATERIALS

A. Asphalt Cement: ASTM D946.

B. Aggregate for Base Course: to comply with the authority having jurisdiction.

C. Aggregate for Binder Course: to comply with the authority having jurisdiction.

D. Aggregate for Wearing Course: to comply with the authority having jurisdiction.

E. Fine Aggregate: to comply with the authority having jurisdiction.

F. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

G. Fiber Reinforcement: Synthetic fibers shown to have long-term resistance to deterioration when in contact with alkalis and moisture; 1/2 inch length.

H. Primer: In accordance with State of Arizona Highways standards.

I. Tack Coat: Homogeneous, medium curing, liquid asphalt.

J. Seal Coat: AI MS-19, sand type.

2.03 ASPHALT PAVING MIXES AND MIX DESIGN

A. Asphalt Base Course: 3.0 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

B. Asphalt Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

C. Asphalt Wearing Course: 5 to 7 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

D. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.04 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 AGGREGATE BASE COURSE

A. Place and compact aggregate base course.

3.03 PREPARATION - PRIMER

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

B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd.

C. Use clean sand to blot excess primer.

3.04 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.

C. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with the authority having jurisdiction.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Install gutter drainage grilles and frames in correct position and elevation.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place asphalt wearing course within two hours of placing and compacting binder course.

C. Install gutter drainage grilles and frames in correct position and elevation.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.07 SEAL COAT

A. Apply seal coat to asphalt surface course and asphalt curbs in accordance with AI MS-19.

3.08 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.09 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.10 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 3 days or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 1313
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Paving assemblies.

B. Form materials.

C. Reinforcement.

D. Concrete materials.

E. Concrete sidewalks, stair steps, integral curbs, and gutters.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.

B. Section 03 2000 - Concrete Reinforcing.

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

D. Section 07 9200 - Joint Sealants: Sealing joints.

1.03 REFERENCE STANDARDS

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

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

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

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

E. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.

F. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2024.

G. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.

1.04 SUBMITTALS

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

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

C. Samples: Submit two sample panels, 12 by 12 inch in size illustrating exposed aggregate finish.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI SPEC-301.

2.02 FORM MATERIALS

A. Form Materials: As specified in Section 03 1000, comply with ACI SPEC-301.

2.03 REINFORCEMENT

A. Reinforcing Steel and Welded Wire Reinforcement: Types specified in Section 03 2000.

2.04 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 03 3000.

2.05 ACCESSORIES

A. Surface Retarder:
   1. Color: As selected by Architect from manufacturer's standard range.

B. 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.
   1. Material: ASTM D1751, cellulose fiber.

2.06 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

2.07 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

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

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. Pending Report

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

3.05 PLACING CONCRETE

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

B. Ensure reinforcement, inserts, embedded parts, formed joints, are not disturbed during concrete placement.

C. Apply surface retarder to all exposed surfaces in accordance with manufacturer's instructions.

3.06 JOINTS

A. Align joints with adjacent surfaces.

3.07 EXPOSED AGGREGATE

A. Wash concrete surfaces to which surface retarder has been applied with clean water, and scrub with stiff bristle brush exposing aggregate to match sample panel.

3.08 FINISHING

A. Curbs and Gutters: Light broom, texture parallel to pavement direction.

B. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
   1. Provide free access to concrete operations at project site and cooperate with appointed firm.

B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.

3.10 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 32 1723
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Painted pavement markings.

B. Raised pavement markings.

C. Plastic pavement markings.

1.02 RELATED REQUIREMENTS

A. Section 32 1216 - Asphalt Paving.

B. Section 32 1713 - Parking Bumpers.

1.03 REFERENCE STANDARDS

A. AASHTO M 249 - Standard Specification for White and Yellow Reflective Thermoplastic Striping Material (Solid Form); 2012 (Reapproved 2020).

B. ASTM D4505 - Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life; 2012 (Reapproved 2017).

C. FHWA MUTCD - Manual on Uniform Traffic Control Devices; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work of this section with adjoining work.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by affected installers.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate survey control points and pavement markings.

C. Shop Drawings: Indicate traffic management plan with barricades, cones, and temporary markings.

D. Product Data: Manufacturer's data sheets on each product to be used.

E. Certificates: Submit for each batch stating compliance with specified requirements.
   1. Painted pavement markings.
   2. Raised pavement markings.
   3. Plastic pavement markings.

F. Manufacturer's Instructions:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Paint: 2 containers, 1 gallon size, of each type and color.
   3. Extra Markers: 5 percent, of each type and color.

1.06 QUALITY ASSURANCE

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

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment, accompanied by batch certificate.

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

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

1.09 SEQUENCING

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of markings.

PART 2 PRODUCTS

2.01 PAINTED PAVEMENT MARKINGS

A. Comply with State of Arizona Highway Department standards.

B. Comply with FHWA MUTCD.

C. Painted Pavement Markings: As indicated on drawings.

2.02 RAISED PAVEMENT MARKINGS

A. Comply with State of Arizona Highway Department standards.

B. Comply with FHWA MUTCD.

C. Surface Reflectors: Bidirectional, visible to approaching traffic; capable of withstanding pavement-rated loading.
   1. Housing: Plastic, yellow.
   2. Lens: Prismatic, acrylic, yellow.

D. Delineator Posts: All-direction visibility, reboundable.
   1. Upright:
      a. Material: Polypropylene.
      b. Height: 24 inches (610 mm).
      c. Width: 3 inches (76 mm).
   2. Base:
      a. Material: Acrylonitrile butadiene styrene.
   3. Mounting Hardware: Stainless steel.

2.03 PLASTIC PAVEMENT MARKINGS

A. Comply with State of Arizona Highway Department standards.

B. Comply with FHWA MUTCD.

C. Plastic Pavement Markings: Preformed, uniform, smooth edges.
   1. Marking Tape: Vinyl, with retroreflective beads, in accordance with ASTM D4505.
      a. Class: Class 1, in accordance with ASTM D4505.
      b. Color: As indicated on drawings.
      c. Primer: As recommended by manufacturer.
   2. Thermoplastic Markings: Alkyd, in accordance with AASHTO M 249.
      a. Color: As indicated on drawings.

b. Existing-Pavement Primer: Asphalt, thermosetting adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify existing markings for removal.

B. Verification of Conditions: Verify that pavement is dry and ready for installation.

C. Notify Architect of unsatisfactory conditions before proceeding.

3.02 PREPARATION

A. Establish survey control points for locating and dimensioning of markings.

B. Place barricades, warning signs, and flags as necessary to alert approaching traffic.

C. Clean surfaces prior to installation.
   1. Remove dust, dirt, and other debris.
   2. Remove rubber deposits, existing paint markings, and other coatings.

D. Temporary Markings: Apply as directed by Architect.

E. Apply paint stencils by type and color at necessary intervals.

3.03 INSTALLATION

A. General:
   1. Position pavement markings as indicated on drawings.
   2. Field location adjustments require approval of Architect.
   3. Allow traffic movement without hindrance.

B. Painted Pavement Markings:
   1. Apply in accordance with manufacturer's instructions.
   2. Apply in accordance with State of Arizona Highway Department standards.
   3. Apply in accordance with FHWA MUTCD standards.

C. Raised Pavement Markings:
   1. Install in accordance with manufacturer's instructions in manner necessary to maintain manufacturer's warranty.
   2. Install in accordance with State of Arizona Highway Department standards.
   3. Install in accordance with FHWA MUTCD standards.
   4. Surface Reflectors:
      a. Cut pavement and remove depth equal to height of reflector.
      b. Partially fill area with road marker epoxy adhesive.
      c. Press reflector into adhesive and apply pressure.
   5. Delineator Posts:
      a. Base: Drill anchor holes into pavement. Place anchor sleeves into anchor holes flush with pavement surface. Screw anchor bolts through base holes into anchor sleeves.
      b. Upright: Attach post to base before anchoring in place.

D. Plastic Pavement Markings:
   1. Install in accordance with manufacturer's instructions in manner necessary to maintain manufacturer's warranty.
   2. Install in accordance with State of Arizona Highway Department standards.
   3. Install in accordance with FHWA MUTCD standards.
   4. Marking Tape: Place tape on pavement smooth and without wrinkles. 1/4 inch (6 mm) maximum gap between adjacent pieces. Immediately apply uniform pressure until firmly adhered.
      a. Apply primer to pavement at a rate of 1 oz/sq ft (3 L/sq m) and allow to set for 10 minutes prior to taping.
   5. Thermoplastic Markings: Preheat pavement surface to 275 degrees F (135 degrees C). Place markings on pavement smooth and without wrinkles. 1/4 inch (6 mm) maximum

gap between adjacent markings. Uniformly heat markings between 400 degrees F (204 degrees C) to 440 degrees F (227 degrees C). Do not overheat, scorch, or disperse embedded glass beads.

a. Apply primer according to manufacturer's recommendations.

3.04 TOLERANCES

A. Maximum Variation From True Position: 3 inches (76 mm).

B. Maximum Offset From True Alignment: 3 inches (76 mm).

3.05 FIELD QUALITY CONTROL

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

B. Perform field inspection for deviations from true alignment or material irregularities.

C. If inspections indicate work does not meet specified requirements, rework and reinspect at no cost to Owner.

D. Allow the pavement marking to set at least the minimum time recommended by manufacturer.

3.06 CLOSEOUT ACTIVITIES

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

B. Temporary Markings: Remove without damaging surfaces.

3.07 PROTECTION

A. Prevent approaching traffic from crossing newly applied pavement markings.

B. Replace damaged or removed markings at no additional cost to Owner.

C. Preserve survey control points until pavement marking acceptance.

END OF SECTION

SECTION 32 3113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Manual gates with related hardware.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

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

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

C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2022).

D. ASTM A428/A428M - Standard Test Method for Weight [Mass] of Coating on Aluminum-Coated Iron or Steel Articles; 2021.

E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

F. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.

G. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework; 2018 (Reapproved 2022).

H. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2018 (Reapproved 2022).

I. BHMA A156.3 - Exit Devices; 2025.

J. CLFMI CLF-FIG0111 - Field Inspection Guide; 2014.

K. CLFMI CLF-PM0610 - Product Manual; 2017.

L. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.

M. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing; 2023.

N. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric); 1990.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

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

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Design Calculations: For high wind load areas, provide calculations for fence fabric and accessory selection as well as line post spacing and foundation details. See CLFMI WLG 2445 for line post and spacing guidance.

D. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

E. Manufacturer's Qualification Statement.

F. Fence Installer Qualification Statement.

G. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

1.05 QUALITY ASSURANCE

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

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.06 WARRANTY

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

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Line Posts: 1.9 inch diameter.

B. Curved Line Posts: 1.9 inch diameter formed with a 55 degree angle in the direction of the climber.

C. Corner and Terminal Posts: 2.38 inch diameter.

D. Curved Corner and Terminal Posts: 2.38 inch diameter formed with a 55 degree angle in the direction of the climber.

E. Gate Posts: 3-1/2 inch diameter.

F. Curved Gate Posts: 3-1/2 inch diameter formed with a 55 degree angle in the direction of the climber.

G. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

H. Bottom Rail: 1.66 inch diameter, plain end, sleeve coupled.

I. Gate Frame: 1.66 inch diameter for welded fabrication.

J. Fabric: 2 inch diamond mesh interwoven wire, 6 gauge, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.

K. Tension Wire: 6 gauge, 0.1920 inch thick steel, single strand.

L. Tie Wire: Aluminum alloy steel wire.

2.02 MATERIALS

A. Posts, Rails, and Frames:
   1. ASTM A1011/A1011M, Designation SS; hot-rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi; zinc coating complying with ASTM F1043 and ASTM F1083.
   2. Line Posts: Type I round in accordance with FS RR-F-191/1D.
   3. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

B. Wire Fabric:
   1. ASTM A392 zinc coated steel chain link fabric.
   2. Comply with CLFMI CLF-PM0610.

2.03 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open positionor where drawings call for exit device, panic bar and related components.

B. Hinges: Finished to match fence components.
   1. Brackets: Round.
   2. Mounting: Center.
   3. Closing: Manual.

C. Latches: Finished to match fence components.
   1. Brackets: Round.
   2. Locking: Mechanical.

2.04 LIGHT-DUTY ARCHITECTURAL HARDWARE

A. Exit Devices: Aluminum, 36 inches (914 mm) wide.
   1. Performance Criteria: Comply with BHMA A156.3, Grade 1.
   2. Provide strike of type recommended by manufacturer for application indicated.
   3. Aluminum Finish: 628.

B. Mechanical Latches: Steel latch, with mounting bracket for a nominal 1-5/8 inches (41 mm) diameter pipe post frame.
   1. Auto-Latches: Push-rod, self-latching, padlockable assembly.
      a. Swing Direction: Both ways.
      b. Mounting to Gate Frame: U-bolts.
      c. Locking: Padlockable from either side.
   2. Single-Point Latches for Two-Leaf Gates: Pivoting double latch and strike assembly.
      a. Adjustment Range: Designed for gaps of 2-1/2 to 6 inches between gate leaf frames.
      b. Mounting to Gate Frame: U-bolts.
      c. Locking: Padlockable from either side.
   3. Finish: Galvanized.

C. Hinge Set: Self-closing, for top and bottom support of swinging gate.
   1. Swing Direction: One way.
   2. Mounting to Round Fence Post and Gate Frame: Integral clamp.
   3. Finish: Galvanized.

2.05 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

C. Extension Arms: Cast steel galvanized, to accommodate 3 strands of barbed wire, single arm, vertical.

2.06 FINISHES

A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 ounces per square foot.

B. Components (Other than Fabric): Aluminum coated at 0.40 ounces per square foot, when measured in accordance with ASTM A428/A428M.

C. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

D. Accessories: Same finish as framing.

E. Color(s): To be selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

B. Preinstallation Testing: Test areas for ledge.

3.02 PREPARATION

A. Removal: Obstructions or debris.

3.03 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate posts plumb , in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

G. Install a 7 gauge, 0.1770 inch coil spring wire in place of top rail.

H. Install center brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 28 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade.

L. Bury the chain link fabric 12 inches or more below finish grade.

M. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

N. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

O. Install bottom tension wire stretched taut between terminal posts.

P. Install support arms sloped inward and attach barbed wire; tension and secure.

Q. Do not attach the hinged side of gate to building wall; provide gate posts.

R. Install hardware and gate with fabric to match fence.

S. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

T. Peen all bolts upon installation.

U. Perform three random field inspections confirming proper installation.

V. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

C. Do not infringe on adjacent property lines.

3.05 FIELD QUALITY CONTROL

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

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Post Settings: Randomly inspect three locations against design for:
   1. Hole diameter.
   2. Hole depth.
   3. Hole spacing.

D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

E. Gates: Inspect for level, plumb, and alignment.

F. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.

3.06 CLEANING

A. Leave immediate work area neat at end of each work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

F. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

E. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Location: At project site.

END OF SECTION

SECTION 32 3300
SITE FURNISHINGS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

1.02 SUBMITTALS

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

B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.

1.03 QUALITY ASSURANCE

1.04 WARRANTY

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

B. Provide manufacturer’s warranty against defects in materials or workmanship for ductile iron castings for a period of 10 years from Date of Substantial Completion.

C. Provide manufacturer’s Lifetime Warranty against defects in materials or workmanship for wood benches manufactured from solid teak.

PART 2 PRODUCTS

2.01 BOLLARDS

A. Steel Pipe Bollards: Hollow steel pipe with plain shaft.
   1. Shape: Round.
   2. Diameter: 4 inches.
   3. Cap: Concrete fill rounded-off to form a smooth convex cap.
   4. Materials:
      a. Steel Pipe: ASTM A53/A53M, standard weight.
      b. Factory Finish: Primed.
   5. Mounting: In-ground.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 INSTALLATION

END OF SECTION

SECTION 32 3313
SITE BICYCLE RACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior bicycle racks.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Mounting surface for bicycle racks.

B. Section 05 5000 - Metal Fabrications: Custom metal outdoor furnishings.

C. Section 32 1313 - Concrete Paving: Mounting surface for bicycle racks.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2300 - Alternates for product alternatives affecting this section.

1.04 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

1.05 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Exterior Bicycle Racks:
   1. Dero Bike Rack Co: Rolling Rack RR5H, www.dero.com.

2.02 BICYCLE RACKS

A. Exterior Bicycle Racks: Device allows user-provided lock to simultaneously secure one wheel and part of the frame on each bicycle parked or racked.
   1. Style: Serpentine rack formed from a continuous round pipe.
   2. Capacity: 11 bicycles.
   3. Mounting, Ground: In-ground anchor.
   4. Accessories: In-ground grout cover.

B. Materials:
   1. Pipe: Carbon steel, ASTM A53/A53M, Schedule 40.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive bicycle racks.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

C. Do not begin installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Ensure surfaces to receive bicycle racks are clean, flat, and level.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install level, plumb, square, and correctly located as indicated on drawings.

C. In-Ground Anchor Installation:
   1. Prepare holes in size according to manufacturer's instructions.
   2. Place anchoring bolts through the holes in pipe.
   3. Lower rack into holes, ensuring the bottom of lower bends are at least 1-1/2 inch from the ground.
   4. Place concrete.
   5. Level rack before concrete sets.
   6. Support until dry.

3.04 CLEANING

A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

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

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21 13 13 FIRE PROTECTION

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SECTION 21 13 13

FIRE PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes.
   1. This Section provides for the design and complete engineering and installation of the fire protection system and shall include:
      a. Preparation of design drawings and submittal for approval.
      b. Rework of existing systems to provide a fully sprinklered space, as described on the drawings

B. Work Requirements.
   1. Sprinkler installation work shall be performed by a licensed fire protection system installation contractor.
   2. It will be the responsibility of the contractor to design the sprinkler systems in accordance with the requirements of codes and standards listed in Article 1.02 of this specification, and the design guidelines provided in this specification.
   3. It will be the responsibility of the contractor to provide all design drawings and documents stamped by a qualified Arizona Registered Professional Engineer

1.2 REFERENCES

A. American National Standards Institute, Inc. (ANSI)
   1. B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
   2. B16.9 - Factory-Made Wrought Steel Buttwelding Fittings.

B. American Society for Testing and Materials (ASTM)
   1. A126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   2. A234 - Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

C. American Water Works Association (AWWA)
   1. C500 - Gate Valves, for Water and Sewage Systems

D. National Fire Protection Association (NFPA)
   1. 13 - Installation of Sprinkler Systems.
   2. 14 - Installation of Standpipe and Hose Systems.
   3. 24 - Installation of Private Fire Service Mains and Their Appurtenances.
   4. 30 - Flammable and Combustible Liquids Code.
   5. 72E - Automatic Fire Detectors.

E. Uniform Fire Code

F. Uniform Building Code

G. OSHA Standards.

1.3 SYSTEMS DESCRIPTION

A. Design Requirements
   1. Provide complete fire protection systems as specified and indicated on drawings.
   2. Drawings are diagrammatic and indicate general arrangement of systems and equipment.

3. It will be the responsibility of the Contractor to design the sprinkler system in accordance with the requirements of Codes and Standards listed in Article 1.02 of this specification, and the design guidelines shown on the drawings and provided in this specification.
4. Contractor is to hydraulically calculate sprinkler system in accordance with NFPA 13 requirements based on hazard encountered. Submit plans to City of Mesa for approval and make all changes to drawings required to obtain approval.

B. Wet Pipe Sprinkler System Design Criteria.
1. The sprinkler system shall be hydraulically designed in accordance with NFPA 13.
2. The sprinkler system shall be of the wet pipe type.
3. The system demand shall be calculated to the water main tap.
4. Water demand pressure shall be a minimum of 10 psi below the water supply pressure.
5. Design density shall be 0.1 gallon per minute per square foot based on light hazard occupancy for the hydraulically most remote 1500 square feet.
6. Protection area limits shall be 226 square feet per sprinkler.
7. C-factors for calculating friction loss in pipe shall be:
   a. 120 for steel pipe.
   b. 140 for lined ductile iron pipe.
   c. 100 for unlined ductile iron pipe.
8. The following flow-rates in piping shall not be exceeded:
9. Aboveground piping - 20 feet/second.
10. Flow rates shall be shown on the hydraulic calculation sheets.
11. Nozzle identification, gpm, pipe sizes, pipe and equivalent fitting lengths, elevation, friction loss, pressure summary including velocity pressure, adjusted flow and velocities in fps shall be shown on calculation sheets.

1.4 SUBMITTALS

A. Shop Drawings and Product Data.
1. Refer to Section 23 05 00.
2. Before any Work is commenced, submit three complete sets of Shop Drawings, material and equipment lists and full descriptive data for each system for approval to:
3. City of Avondale.
4. Owner.
5. Architect.
6. Partial submittals are not acceptable.
7. Shop Drawings shall include ceiling plans showing sprinkler head locations. Refer to architectural drawings for location of sprinkler heads. Head location shall not be changed without approval of Architect.
8. Sprinkler drawings shall be legible, show exact piping arrangement and show all pipe lengths, valves, fittings and sizes.
9. Sprinkler drawings shall show section views and sufficient notes to provide full descriptive data for review, except for flow-requirements which shall be shown on calculation sheets.
10. Coordination with all drawings is required for bidding and installation.

B. Qualifications of Installer
1. Prior to installation, submit data for approval of the authority having jurisdiction showing that the Contractor has successfully installed fire protection systems of the same type and design as specified herein, or that the Contractor has a firm contractual agreement with an installer having such experience.
2. The data shall include the names and locations of at least two installations where the Contractor, or installer referred to above, has installed such systems. Indicate the type and design of these systems and certify that these systems have performed satisfactorily in the manner intended for a period of not less than 18 months.
3. The Owner may reject any proposed supplier or installer who cannot show evidence of such qualifications.

C. Record Drawings.

1. Upon completion of the Work, provide a complete set of record drawings of fire protection system. Record drawings shall be reproducible drawings on mylar film with title block similar to full size Project Drawings and a size of 42 by 30 inches.

1.5 WARRANTY

A. Refer to Section 23 05 00.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aboveground Piping
1. Fire protection piping shall be schedule 40 black steel conforming to ASTM 19-20 and NFPA 13. Piping shall be manufactured in the United States or in Canada.
2. Provide standard fittings in entire sprinkler system, no bushing (either hexagonal or face). Fittings shall be in accordance with NFPA 13.

2.2 SPRINKLER HEADS

A. Sprinkler heads shall be of fast response and the automatic pendant with chrome escutcheon type. Sprinkler heads shall be of the manufacturer's standard product and match the style of existing sprinkler heads.

B. All sprinkler heads shall be new. Reuse of existing sprinkler heads is prohibited.

2.3 ACCESSORIES

A. Hangers
1. Hangers shall be installed in accordance with NFPA 13 and Section 23 05 00.

B. Sleeves and Cover Plates
1. Refer to Section 23 05 00.

C. Pipe Jointing
Refer to Section 23 05 00.

PART 3 EXECUTION

3.1 ERECTION, INSTALLATION, APPLICATION

A Spacing and Location of Sprinklers
1. Spacing and location of sprinkler heads shall be in accordance with NFPA 13 and as shown on the Drawings.
2. Locate sprinkler heads as indicated on reflected ceiling plans and applicable shop drawings. The installer shall locate sprinkler heads to avoid conflicts with lighting, diffusers, equipment and structural obstructions located in the ceiling.

B Welding
1. General.
a. Shop welded piping may be used for automatic sprinkler systems in lieu of screwed or flanged fittings. Joining of pipe for installation shall be by means of screwed fittings, flanged fittings or by mechanical grooved couplings. Field welding or torch cutting shall not be permitted.
2. Welded fittings
a. Welded fittings shall be in compliance with ANSI B16.9 for factory made wrought steel buttweld fittings, and ASTM A234 for piping fittings of wrought carbon steel and alloy steel for moderate and elevated temperatures.
b. Factory fabricated reinforcing saddles with threaded outlets shall be permitted provided the outlet size does not exceed 1/2 of the pipe diameter and the fittings are shop welded only.

3. Welder qualifications and procedures
   a. Refer to Section 23 05 00.

3.2 FIELD QUALITY CONTROL

A Testing.
1. General
   a. Piping shall be tested in accordance with NFPA 13 and 14 for aboveground piping.
   b. The request for formal inspection shall be submitted to the Owner at least five working days prior to the date of the inspection. A competent representative of the Contractor and other required authorities shall be present during the inspection. An inspection of the system shall be made and shall include actual operation of all mechanical and electrical equipment.
   c. The Contractor shall be responsible for supplying all appliances and equipment required for satisfactorily testing the system.
   d. Tests shall be made before piping is concealed.
2. Test conditions
   a. When connecting to piping not installed or tested under this Contract, the Contractor is responsible for the integrity of piping to a distance of three feet beyond the connection point should an existing fitting be located between the point of connection and limit of ten feet, the Contractor's responsibility shall be increased ten additional feet in all directions from the center of the fitting.
   b. Should the existing piping fail beyond the limits stated above, the Owner shall be responsible for repairs.
3. Flow tests
   a. Piping shall be hydrostatically tested at not less than 200 psi for two hours or at 50 psi in excess of the maximum static pressure when the maximum static pressure is in excess of 150 psi.
   b. Aboveground pipe shall show no visible signs of leakage when subjected to hydrostatic test pressures.
4. Test reports
   a. When tests have been completed and all necessary corrections made, submit a signed and dated performance certificate, record drawings and full descriptive data for each tested system in this Section including operation and maintenance manuals.
   b. Field inspections and tests to determine conformance with the specified requirements shall be performed in the presence of the Architect and Owner.
   c. For water distribution systems aboveground, provide the Owner with three copies of each of the following:
      1) Hydrostatic test certificate.
      2) Flushing certificate

END OF SECTION

RSECTION 22 05 00

COMMON RESULTS FOR PLUMBING WORK

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes valves, piping specialties, gages, thermometers, supports and other such products that are common to more than one Section of Divisions 22 and 23.

B. This Section also includes supplemental requirements and installation materials common to more than one Section of Divisions 22 and 23.

C. Refer to the other sections of Divisions 22 and 23 and the Drawings to determine the extent of the required Work. Mechanical materials and methods for other systems, not described in this Section, are specified in the various mechanical sections.

1.2 REFERENCES

A. American Society of Mechanical Engineers (ASME)
1. B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).
2. B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
3. B16.5 - Pipe Flanges and Flanged Fittings.
4. B16.11 - Forged Steel Fittings, Socket-Welding and Threaded.
5. B31.1 - Power Piping.
6. B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.

B. American Society for Testing and Materials (ASTM)
1. A105/A105M - Specification for Forgings, Carbon Steel, for Piping Components.
2. A126 - Specifications for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
3. A216/A216M - Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
4. A278 - Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F.
5. A351/A351M - Specification for Castings, Austenitic, Austenitic-Ferric (Duplex) for Pressure Containing Parts.
6. A743/A743M - Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
7. B62 - Specification for Composition Bronze or Ounce Metal Castings.
8. B127 - Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
9. D1784 - Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
10. E11 - Specification for Wire-Cloth Sieves for Testing.
11. E119 - Test Methods for Fire Tests of Building Construction and Materials.
12. E814 - Test Method for Fire Tests of Through-Penetration Fire Stops.

C. Expansion Joint Manufacturers Association (EJMA)
1. Standards of the Expansion Joint Manufacturers Association

D. International Conference of Building Officials (ICB0)
1. Uniform Building Code (UBC), Chapter 43 - Fire Resistive Standards.

E. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.(MSS)
1. SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture.
2. SP-69 - Pipe Hangers and Supports - Selection and Application.
3. SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

F. National Fire Protection Association (NFPA) 1. 13 - Installation of Sprinkler Systems.

G. Underwriters Laboratories, Inc. (UL)
1. 1479 Fire Tests of Through-Penetration Firestops.

1.3 SUBMITTALS

A. Shop Drawings
1. Refer to Section 01300.

B. Submittals Required.
1. Manually operated valves.
2. Check valves.
3. Firesafing.
4. Pipe sleeves above grade.
5. Thermometers.
6. Pressure gauges.
7. Strainers.
8. Expansion joints.
9. Hangers and supports.
10. Insulated pipe supports.
11. Balancing valves.
12. Submit for approval prior to installation support equipment and method for hanging, guiding and anchoring pipe 4-inch and larger from the building structure. The building structure is defined as: beams, concrete joists, and columns. Submittal may be in the form of sketches indicating support and hanging equipment, load capacities, types, make, size and locations.

PART 2 PRODUCTS

2.1 VALVES

A. General
1. Provide valves of manufacturers listed below and of the figure numbers listed, or as updated by the manufacturer. Submittals containing outdated figure numbers will be rejected. Manufacturers and numbers not listed are unacceptable.
2. Valve packing containing asbestos material will not be permitted.
3. Equip bronze globe valves with a hexagon gland follower.
4. Equip bronze globe valves with malleable iron hand wheels.
5. Provide manually operated valves, pad-lockable in any position.
6. Provide valves, except check valves, which are capable of being packed under pressure when wide open by means of a bevelled backseat and bonnet.
7. Provide all globe valves with four-sided stem to hand-wheel connection with selflocking nut.

8. All ball valves shall be of the full port type.

B. Domestic Hot and Cold Water

1. Isolation and throttling valves - 2-inch and smaller

a. Class 150 psi swp, 600 psi w.o.g.; two-piece; 80 per cent of port; bronze body; glass filled teflon seat and seal; hard face chromium-plated ball; oval handle with locking feature; threaded ends. Provide valves with stem extensions of the proper length on insulated services.

Conbraco Apollo	70-100
Crane	2182
Grinnell	3700
Hammond	8501
Jamesbury	11-1100TT
Milwaukee	BA-100
Nibco	T-580-BR-R-70
Stockham	S-216-BR-R-T
Watts	B-6002

2. Isolation and throttling valves - 2-1/2-inch and larger (except steam and condensate)

a. Butterfly 100% bubble-tight shut-off; rated 175 psi w.o.g.; full lug type only; suitable for dead-end service to full shut-off differential of valve with downstream flange removed; cast iron body; bronze disc; stainless steel stem; EPDM seat; manual lever-lock operator; minimum 2-inch extended neck for insulation; phenolic backed liner. Provide gear operators with pad lock feature on all valves 8-inch and larger. Valves shall have two-year warranty

Norris	
Center Line	200 Series

3. Check valves - 2-inch and smaller

a. Class 200 psi swp, 400 psi w.o.g.; bronze body, disc and seat; regrinding; screwed end.

Crane	36
Hammond	IB944
Lunkenheimer	544Y
Milwaukee	508
Nibco	T-453-B
Powell	560
Stockham	B-345
Walworth	3420

C. NATURAL GAS

1. 50-mm (2-inch) and smaller: class 175; semi-steel body; semi-steel, lubricated plug; wrench operated with locking device; screwed end.

Homestead	601/611
Milwaukee	BB2-100
Nordstrom	142
Resun	R-1430
Serck Audco	LSW144GG
Walworth	1796

-Or-

2. 12.5-mm (1/2-in.) to 25-mm (1-inch), forged brass body and ball, manually operated gas valve, full port, 150 psi steam, 600 psi w.o.g., threaded ends, [Tee] [lever] handle, in full compliance with AGA 3-88-5 psi gas and ANSI Z21.15.

Conbraco	Series GB-10
Grinnell	171N
Hammond	8901UL

2. 63-mm to 100-mm (2-1/2-inch to 4-inch): class 200; semi-steel body; semi-steel, lubricated plug; wrench operated with locking device; flanged end.

Homestead	612
Nordstrom	143
Resun	R-1431
Serck Audco	LSW133GG
Walworth	1797F

1727F (to 8

2.2 STRAINERS

A Chilled Water, Do Heating Hot Water, Domestic Hot and Cold Water

1. 2 inches and smaller

a. Bronze body "Y" pattern, threaded ends, self cleaning, ASTM B62, 400# wog at 150 degrees F rating with 0.033-inch perforated stainless steel strainer

Armstrong	F4SC
Keckley	Style F
Mueller	#351M
Yarway	911

2. 2-1/2 inches and larger

a. Cast iron 125 lb. flanged "Y" pattern, self-cleaning, ASTM A278 Class 30, 400# wog, 150 degrees F rating with 0.045-inch perforated stainless steel screen.

Armstrong	A1FL-125 Fig. G-2
Keckley	Style A
Mueller	#758
Yarway	M804

2.3 PIPE SLEEVES ABOVE GRADE

A Sleeves in Non-Rated Walls

1. Provide pipe sleeves of steel pipe in masonry or concrete walls and of 24 gage galvanized steel in non-masonry walls or partitions.

B Sleeves in Fire Rated Walls and Floors

1. Sleeves for Metallic Pipe

a. Provide manufactured, pre-engineered, fire-rated pipe sleeve kits for all fire rated wall and floor penetrations.

b. Provide sleeve and packing having the same fire rating as the wall or floor construction in which they are installed. Provide sleeves which have passed the ASTM E119 test, per UBC Chapter 43 for pipe penetrations.

c. Provide fire-rated sleeve kit assemblies that display a certified listing stamp by UL, FM or Warnock Hersey documenting a passage of test and code requirements as stipulated in ASTM E814 and UBC, Chapter 43.

d. Bare pipe: Encircle all steel pipe or copper tubing penetrating fire rated walls or floors by sheet metal sleeves sized for maximum one-inch annular spacing between pipe and sleeve. Pack the spacing on each end with UL-rated ceramic fiber strip insulation and seal with 3M CP25 WB intumescent caulking or other listed sealant.

1. Approved models: Pipe Shields, Inc. Models: F3000, F3200, F3400, F3600, F6000, F6200, F9000, and F9200, or as approved.

e. Insulated pipe: Provide sleeves for insulated pipe the same as for bare pipe, but with the addition of a 360-degree cylinder of waterproofed calcium silicate insulation encasing the pipe and covered with galvanized sheet metal shielding, all sized to extend to a minimum of one inch beyond wall or floor.

1. Approved models: Pipe Shields, Inc. Models: F1000 thru F1600, F2000 thru F2600, F4000 thru F5200 and F7000 thru F8200, or as approved.

2. Sleeves for Non-Metallic Pipe

a. Encircle all bare or insulated non-metallic pipe penetrating fire walls with sheet metal sleeves sized for one inch annular spacing between pipe and sleeve. Pack spacing on each end with UL rated ceramic batting. In addition, encase the pipe in a 360 degree cylinder of waterproofed calcium silicate insulation and cover with galvanized sheet metal shielding, all sized to extend a minimum of 24 inches beyond fire wall.

b. Approved models: Pipe Shields, Inc. Models F1800 and F2800 or as approved.

C Sleeves in Exterior Walls and Floors

1. For piping penetrating exterior walls or exterior floors above grade, provide sleeves as specified for pipe sleeves on or below grade.

2.4 FIRESAFING

A At all cored, irregular, angular and any other non sleevable openings for pipe penetrations of fire rated walls and floors, provide a permanent firestop system.

B Provide a system that consists of a water-based firestop compound as the fill, void or cavity material along with appropriate damming material (as per manufacturer's instructions). Provide a firestop compound that does not contain any solvents, inorganic fibers, or silicone compounds and is pigmented for ease of inspection. Provide a penetration seal material that is unaffected by moisture and maintains the integrity of the floor or wall assembly for its rated time period when tested in accordance with ASTM E814 (UL 1479). Provide a system that is UL Classified for up to and including 3 hours.

1. For metallic pipe Flame-Safe FS900 or FST900 Series compounds as manufactured by International Protective Coatings, Corp. or equal product of Flame Stop, Inc., Tremco or Specified Technologies, Inc..

2. For non-metallic pipe, provide a firesafing device as manufactured by International Protective Coatings Corp. FSD 200/300/400 Series or equal product of Flame Stop Inc., Tremco or Specified Technologies, Inc.

2.5 PRESSURE GAUGES

A 4-1/2-inch dial size, cast aluminum case, glass window, chromium plated friction type ring, stainless steel rotary type movement, phosphor bronze bourdon tube and brass socket; white dial face with black figures, micrometer adjustable pointer. Accuracy 1/2 percent of scale range, ASME B40.1 Grade 2A.

Ashcroft	1220
Trerice	500X
Weiss	UG-1
Weksler	AA14

B Select the proper range for each specific use so that the average operating pressure falls approximately in the middle of the scale selected. Pressure gauges across pump suction and discharge lines to be compound gauges.

C Provide gauges on steam service with 1/4-inch needle valves and 1/4-inch iron coil siphons.

	Needle Valves	Siphons
Ashroft	7001-L	10981 Trerice
735-4	885-1	
Weiss	25NVSS	SY-14S
Weksler	AV44	A031

D Provide gauges on all other services with 1/4-inch lever handle union cocks and 1/4-inch pressure snubbers.

	Cocks	Snubbers
Ashcroft	1094	1112B
Trerice	880	872-1
Weiss	LCU-14	PSN-B
Weksler	A12 W/Union	RS1

2.6 THERMOMETERS

A 3-1/2-inch diameter, vapor actuated, stainless steel case, white background with black markings, removable sealed acrylic window, adjustable black finish stainless steel pointer, bronze movement with bronze bearings, with 5 feet of double braided bronze over copper capillary, bulb to suit and adjustable angle mounting bracket.

Ashcroft	600A
Trerice	V80025
Weiss	35ZL7421105
Weksler	362AJIL

B Where insulation thickness exceeds 2 inches, use a longer stem with an extension neck brass separable well.

C Select the proper range so that the operating temperature of the material being measured will fall approximately in the middle of the scale.

D Provide stems with insertion lengths roughly half of the pipe diameter; minimum insertion: 2 inches. For thermometers installed on tanks, 5 inches minimum insertion length.

2.7 MECHANICAL EXPANSION JOINTS

A For pipe NPS 2 and smaller

1. Packless bellows type with internal guide, anti-torque device, as manufactured by Tube Turns; Robertshaw-Fulton; Adsco; Flexonics or Metraflex.
2. Use steel joints on ferrous metal pipes and copper or brass joints on copper pipes.

B For pipe NPS 2-1/2 and larger
1. Self-equalizing, packless, corrugated type having stainless steel element, flanged ends, equalizing rings and inner flow liners, as manufactured by Adsco; Hyspan; Keflex; Tube Turns or Metraflex.
2. Provide companion flanges of size and type to fit pipes where installed.

2.8 HANGERS AND SUPPORTS

A General
1. Hangers and supports materials, design and manufacture in conformance with MSS-SP-58.
2. Hangers and supports selection and application in conformance with MSS-SP69.
3. Hot-dip galvanize components of all hangers and supports.
4. Grinnell; B-line Systems, Inc.; Fee and Mason; Carpenter and Paterson; NPS Industries or Piping Technology & Products, equal to the Grinnell figures listed below.
5. Riser clamps: Grinnell Fig. 261 galvanized steel pipe clamp
6. On insulated piping, locate hangers or supports outside the insulation and provide insulated supports.
7. On 1" pipe size and smaller connected to vibrating equipment, provide Vibra-Zorb cushioned supports.

B Insulated Pipe Supports
1. Provide at each support point on insulated piping, a 360-degree insert of high density, 100 psi, waterproofed calcium silicate, encased in a 360-degree galvanized sheet metal shield. Insert: the same thickness as adjoining pipe insulation. Shield length, gage and installation: in accordance with manufacturer's standard. Where pipe hanger spacing exceeds ten feet on piping NPS 10 and larger, provide a double layer shield on the bearing surface.
2. Provide insulated pipe supports that are load rated. Load ratings: established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes: MSS SP-58, MSS SP-69, and MSS SP89.
3. Load tests: made on both supporting materials and configurations. All tests to be performed by an independent testing laboratory. Make results of pertinent tests available, on request, to the purchaser.
4. Insulated pipe supports manufacturers: Pipe Shields, Inc.; Value Engineered Products, Inc.; American Mechanical Insulation Sales, Inc.; B-line systems, Inc.; or Rilco Mfg. Co.; equal to the Pipe Shields model numbers listed below.

Hanger/Insulation Support

Service/Pipe Size	Thru NPS 2	NPS 2-1/2 thru 6	NPS 8 & up
Ambient Temp. Piping			
Suspended Support	Fig. 97/NA	Fig. 260/NA	Fig. 260/NA
Base Support	Fig. 262/NA	Fig. 191/NA	Fig. 264/NA
Cooled Piping			

Suspended Support Fig. 260/A2000 Fig. 181/A4000 Fig. 171/A6000 Base Support Fig. 262/A2000 Fig. 274/A4000 Fig. 274/A6000

C Hangers and Supports Attachments

1. Provide C-clamps for piping up to NPS 2 pipe: steel or malleable iron, galvanized, with hardened steel cup-point set, screw, lock-nut and galvanized, retaining clip, placed on the up-stream side of the beams, Grinnell Fig. 86 with Fig. 89 retaining clip. Friction, spring steel, beam clip type hangers are not allowed.
2. Provide beam clamps for water piping NPS 2-1/2 through 6 pipe and for gas/air piping NPS 2-1/2 through 10 pipe: galvanized standard duty steel center I-beam clamps consisting of two half clamps with bolt and nut assembled; Grinnell Fig. 133 .
3. Provide attachment and rod size based on the rod size of the hanger.
4. Provide all threaded type hanger rods of galvanized carbon steel complying with ASME B1.1, Class 2A Fit USS National coarse thread, conforming to MSS-SP-58.
5. Inserts: Grinnell Fig. 282 galvanized malleable iron universal concrete insert.
6. For attaching to rectangular tube structural members, provide Grinnell Fig. 66 welded beam attachment. Provide with bolt and nut for rod size up to 1-inch and pin and cotter pins for rod size 1-1/4-inch and larger.
7. Where piping is supported from walls or columns, provide a Grinnell Fig. 195 galvanized steel bracket (with back-plate where wall mounted).
8. Where multiple pipe runs are to be supported, provide galvanized channel framing trapeze hangers equal to Unistrut P-1000. Secure all pipes to trapeze-type hanger with the following Unistrut roller supports:

   NPS 1 thru 4 pipe P-2474
9. When piping larger than 6 inches is required to be suspended from a concrete structure, provide special fabricated attachments. Submit the detail of these attachments for approval prior to fabrication.
10. Drilled-in inserts: Phillips Ramset/Red Head self-drill internally threaded or as approved.

2.9 V-BELT DRIVES

A Drives

1. Select V-belt drives with a service factor of 1.5 times the motor nameplate horsepower and factors for belt length, effective sheave diameter and arc of contact correction. Minimum arc of contact : 160 degrees of sheave diameter.
2. For fan-motor drive assemblies of 11.2 kw (15 hp), or smaller, provide a motor sheave of cast iron, adjustable type. Fan and motor sheaves to deliver the required fan speed at the mid-range of the motor sheave adjustment.
3. Fractional horsepower motors may be furnished with single groove drive. Provide integral frame motors with two or more groove sheaves depending on the belt horsepower requirements.
4. Provide multiple belts in matched sets and of the static conductive type.
5. Minimum sheave sizes: 3.0-inch pulley diameter for "A" section belts, 5.4-inch pulley diameter for "B" section belts and 9.0-inch pulley diameter for "C" section belts.

B Manufacturer

1. As manufactured by The Browning Company.

PART 3 EXECUTION

3.1 VALVE INSTALLATION

A General

1. Provide isolation valves at each item of equipment or fixture to permit complete isolation of that equipment or fixture from the piping system.
2. Provide isolation valves in piping services where branch lines connect to mains and risers.
3. Provide isolation valves where service is fully open or closed.
4. Provide throttling valves where pressure regulation or modulating flow are required.
5. Provide throttling valves to serve as drain valves at low points and at piping dead ends.
6. Install plugs or caps on all drain, vent or other open ended lines and valves. For drain valves, provide an FPT to male hose thread adapter with screw-on cap with chain, tied to valve handle.

B Isolation Valves and Unions at Equipment

1. Provide isolation valves and unions at the individual connections to equipment, PRV stations and piping elements to permit complete servicing or removal of piping elements and items of equipment.

C Copper Tubing Adapters

1. When connecting copper tubing to valves, install adapters as follows:
   a. Cast copper solder male adapter or union to screwed valves.
   b. Copper solder joint companion flange unit.
2. Solder joint valve substitutions for valves specified are not permitted.

3.2 PIPE LINE STRAINERS

A Install strainers before all traps and pressure reducing stations, temperature regulating valves, condensate return pumps, circulating pumps and other locations where indicated.

B Where a steam coil is provided with a control valve and a strainer ahead of the coil, no strainer is required ahead of the trap.

C Install basket type strainers in a horizontal position only.

D Provide a blow-off valve on all strainers.

E Before starting up systems employing strainers, provide temporary size 20 mesh woven metal wire mesh in the strainers and run the system with the strainer blow-down valves open, thoroughly flushing all slag and dirt from the system. Install drains at the system low points to facilitate this process. After systems have been thoroughly cleaned, remove and dispose of the temporary screens and install the permanent screens.

3.3 PIPE SLEEVES AND COVER PLATES

A Pipe Sleeves Above Grade

1. Install pipe sleeves for piping passing through all floors and walls.
2. Extend pipe sleeves through mechanical equipment room floors and any other floors likely to have water present, 4 inches above finished floor.
3. Where pipe sleeves extend through floors with a waterproof membrane, provide flashing that maintains the membrane integrity.

B Cover Plates

1. Provide hinged chromium-plated cover plates on piping extending into finished areas of the building, through ceilings, walls and floors. Provide cover plates of the proper size to afford complete coverage of the opening. Where pipe insulation is carried through a pipe sleeve, provide a cover plate of sufficient size to fit around the sleeve. Install cover plate to fit snugly against ceiling, wall or floor surface.

3.4 EXPANSION COMPENSATION OF PIPING

A General

1. Install expansion joints, anchors and alignment guides in accordance with the manufacturer's printed installation directions.
2. Install piping to permit freedom of movement during expansion and contraction without causing the piping to become warped, by means of expansion joints, pipe loops or fitting offsets as indicated or required for an approved installation. Provide spring supports and guides where indicated to protect connected apparatus from the strain and weight of the piping.

B Pipe Anchors

1. Incorporate anchors in the piping to maintain permanent pipe position, and properly guide pipe expansion.
2. Construct anchors of steel bands welded to the pipe and solidly attach them to the building construction in an approved manner.

C Pipe Guides

1. Provide pipe alignment guides adjacent to and on each side of expansion loops or joints to control the pipe movement in true alignment. a. 1st guides at 4 pipe diameters each side of device.
   b. 2nd guides at 14 pipe diameters beyond 1st.
   c. Intermediate guides per EJMA Standards of the Expansion Joint Manufacturers Association.

3.5 HANGERS, SUPPORTS AND ATTACHMENTS

A Provide structural supports, miscellaneous steel members, anchors, platforms, braces or tie rods and hangers required for the suspension and placement of the piping, valves and mechanical equipment required for the installation. Prime paint and touch up after erection.

B Support piping directly from the building structure and not from the supporting systems or equipment of other trades.

C Piping up to 4 NPS may be supported from the concrete slab using self-drill drilled-in inserts. Do not support piping from the roof deck.

D Support piping at equipment independently from the structure so that no weight, or expansion and contraction forces will be transmitted to the equipment.

E Use 10 mil plastic wrap around copper pipe on ferrous hangers or supports.

F Install pipe hangers and supports to allow for expansion and contraction, and placed close to fittings, valves and heavy equipment.

G Install pipe hangers and supports in accordance with MSS SP-69 and MSS SP-89.

H Support pipe separately, not in tiers. Trapeze hangers will be permitted, upon approval, where piping is grouped together.

I Provide horizontal piping hangers, rods and supports with provision for a minimum of 13/4 inches vertical adjustment for pipe alignment and provide with lock nuts.

J Install and support piping in a manner to isolate vibration and prevent sagging and movement other than that caused by thermal expansion and contraction.

K Provide maximum spans between hangers for straight horizontal runs of rigidly connected steel pipe and hard drawn copper tube without concentrated loads in compliance with the following table:

Suggested Maximum Span Between Supports - Feet				Minimum
Water (NPS)	Fire Service	Gas/Air Protection	Hanger Service	Rod
1/2	6	-	6	3/8
3/4	6	-	6	3/8
1	8	8	8	3/8
1-1/4	8	8	8	3/8
1-1/2	8	8	8	3/8
2	10	10	10	3/8
3	12	12	12	1/2
4	12	12	12	5/8

L Install pipe support hangers at spacing complying with MSS SP-69.

M Locate hangers for horizontal cast iron soil pipe within 24 inches of each coupling (at tenfoot intervals for 10-foot pipe lengths) or within 18 inches of a coupling used to make a change in direction. Sway brace horizontal cast iron soil piping between each joint on sizes NPS 6 and larger. For joints in hubless cast iron pipe, install couplings with an approved torque wrench at 100 to 125 inch-pounds.

N Provide additional hangers where there are concentrated loads between supports such as flanges, valves and piping specialties.

O Provide a hanger immediately adjacent to each change in direction of the piping.

P Where back to back channels are used to hang piping by spanning between beams, rest the channels on the bottom flanges of the beams and secure to the beams by means of clip angles - 2 per channel welded to the beam and channel webs.

Q When through bolts are used, provide plates or large washers under the heads.

R Determine the spacing of trapeze hangers by the smallest pipe carried and the maximum permissible load recommended for the suspension elements. Single pipe hangers may be used to support small pipe at intermediate points between trapeze hangers if maximum span requirements are exceeded.

S Connect hanger rods to beam clamps, concrete inserts, or expansion anchors.

T Use beam clamps as pipe hanger attachments to the building structural members.

U Do not eccentrically load steel structural members. Top beam clamps, side beam clamps, channel clamps and cantilevered supports are not permitted.

V At the Contractor's option, C-clamps may be used in lieu of beam clamps on individual piping only, up to 2 inches in diameter and only when running perpendicular to the steel member. Do not over-tighten the set screw and thereby over-stress the jaw. Do not use C-clamps on double angle bottom members.

W In concrete structures, use inserts as pipe hanger attachments to the building for piping up to 6 NPS.

X Drilling of concrete for equipment support may be done only upon written consent of the Architect, using self-drill drilled-in inserts only and not hammers of any kind.

Y Secure equipment to floor slabs or concrete bases with cast-in-place anchors. Self-drill drilled-in inserts may be used where circumstances make the use of cast-in-place anchors impracticable.

3.6 V-BELT DRIVES

A Key fan sheaves to the shaft and equip them with split tapered type bushings.

B Statically and dynamically balance sheaves.

C Replace any components of the fan-motor drive assembly for each fan when required to correctly balance the complete fan system.

3.7 GUARDS FOR DRIVES AND ROTATING PARTS

A Belt Guards

1. Provide guards for belted motor drives unless furnished as an integral part of the equipment.
2. Provide guards of galvanized expanded metal, 1/2-inch mesh, U.S. Standard No. 16 gage minimum, constructed by riveting or bolting to a frame on five-inch centers using metal strips or clips to form washers for rivets and bolts or welding to frame on four-inch centers. Fabricate frame from minimum angle iron 38-mm by 1-1/2-inch by 1-1/2-inch by 1/8-inch, or metal construction of equivalent strength.
3. Rigidly brace guards every three feet or fractional part of guard height to some fixed part of the equipment or building structure and have at least four upright frame members each of which shall be extended to the floor or base and securely fastened.

4. Design guards to enclose the drive assembly on all sides and have a minimum clearance of 2 inches from moving parts, to be removable, and allow for one size increase in motor sheave without reconstruction.
5. Provide tachometer openings at shafts and an opening for checking belt tension, each with bolted covers.

B Direct Drive Guards

1. Install a solid guard of No. 20 gage galvanized steel over the coupling of each item of direct driven equipment.

C Fan Inlet and Outlet Guards

1. Provide screen guards with rigid angle frames on fan inlet and outlet openings which are accessible to personnel.

D Extend all guards over exposed rotating shafts.

3.8 MISCELLANEOUS IRON WORK

A Provide structural supports, platforms, braces and tie rods required to support or hang piping valves and mechanical equipment, fabricated and installed in accordance with approved Shop Drawings. Prime paint all miscellaneous iron work and touch-up after erection. Ensure that no support members penetrate the buildings exterior vapor barrier.

3.9 THERMOMETER - INSTALLATION

A Provide thermometers for the following locations and at any other locations shown:

Application
Chilled water supply and return at cooling coils.

END OF SECTION

SECTION 22 05 01

PLUMBING EQUIPMENT AND SPECIALITIES

PART 1 GENERAL

1.1 SUMMARY

A Section Includes
1. This Section provides for the equipment and material required for the building plumbing systems.

B Products Installed but not Furnished Under this Section
1. Certain equipment and fixtures are furnished under other Divisions of the Specifications and require work to be performed under this Section.

1.2 REFERENCES

A. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)
1. 90A - Energy Conservation in New Building Design.

B. American Society of Mechanical Engineers (ASME)
1. Boiler and Pressure Vessel Code.
a. Section VIII - Pressure Vessels, Division 1.
2. B31.1 - Power Piping

C. American Society for Testing and Materials (ASTM)
1. C920 - Specification for Elastomeric Joint Sealants.

D. Center for Disease Control (CDC) Manual-Guide - Safety Management.
1. CDC-22 - Decontamination of Laboratory Sink Drains to Remove Azide Salts.

E. Federal Specification (Fed Spec)
1. O-C-114B - Calcium Hypochlorite, Technical.
2. BB-C-120C - Chlorine, Technical, Liquid.

F. National Fire Protection Association (NFPA)
1. 70 - National Electrical Code.

G. Plumbing and Drainage Institute (PDI)
1. PDI-WH 201 - Water Hammer Arrestors.

1.3 SYSTEMS DESCRIPTION

A. Drainage Systems
1. Provide the drainage systems inside the building extending to a point 5 feet outside the building walls, which include soil, waste and vent piping for all plumbing fixtures and equipment and rain conductors.

B. Domestic Cold Water Piping System
1. Provide the building domestic cold water system by modifying the existing domestic wate system fixtures and equipment, including piping, valves, fittings, and accessories required for a complete system.

C. Domestic Hot Water Piping System

1. Provide the domestic supply and recirculating hot water systems, including piping, valves, heaters, auxiliaries and accessories and connections to equipment requiring hot water.

1.4 SUBMITTALS:

A. Refer to Section 23 05 00.

B. Furnish submittals on the following:
1. Cleanouts.
2. Floor drains.
3. Floor Sinks.
4. Backflow preventers.
5. Fixed air gap fittings.
6. Roof Drains

1.5 WARRANTY

A. Refer to Section 23 05 00

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed in abbreviated form include the following:
Adamson Co., Inc.
Aerco International, Inc.
Amtrol Inc.
Aquafine Corp.
Arkay Corp.
Aurora Pump
Barnstead Co., Sybron Corp.
Bell & Gossett, ITT
Bemis Mfg. Co.
Beneke Div. of Sanderson Plumbing Products, Inc.
Centoco Manufacturing Corp.
Chicago Pump Products
Clayton Mfg. Co.
Cla-Val Co.
Conbraco Industries, Inc.
Continental Water Systems Corp.
Crane/Chem Pump
Febco Div. of CMB Industries
Filterite Membrane
Fisher Controls International, Inc.
Gelman Sciences, Inc.
Goulds, Pumps Inc.
Greer Hydraulics Div. of Figgie International, Inc.
Hersey Beeco
Hersey Products Inc.
Interlake Continental Water Systems
Josam Mfg. Co.
Joy Manufacturing Co., Air Moving Products Div.
Leslie Controls, Inc.
Lochinvar Water Heater Co.
Nash Engineering Co.
Paco Pumps Div., Baltimore Aircoil Co.
Patterson-Kelley Co.
Peerless Pump
PVI Industries, Inc.

Quincy Compressor Div., Colt Industries
Raychem Corp., Chemelex Div.
Roper Pump Co.
Ruud Water Heater Div., City Investing Co.
Sims Co. Inc.
Smith, A.O., Corp., Water Products Co.
Smith, Jay R., Manufacturing Co.
Spence Engineering Co.
Systecon, Inc.
Taco, Inc.
Thermon Manufacturing Co.
Tranter Inc.
Tyler Pipe Industries, Inc. (Wade)
Viking Pump Inc.
Walworth Co.
Weil Pump Co.
Weinman Pump & Supply Co.
Wilkins Regulator Div., Zurn Industries, Inc.
Zurn Industries, Inc.

2.2 DOMESTIC WATER SPECIALTIES

A. Hose Bibbs
1. For water outlets inside the building, provide hose bibbs.
2. 3/4-inch, rough brass body, compression type angle hose valves; similar to Chicago Faucet Co. No. 387-LF with E27 spout outlet with vacuum breaker; American-Standard or Walworth.

B. Reduced Pressure Back Flow Preventers
1. Provide assemblies consisting of two independent "Y" configured check valves and one differential relief valve incorporating two diaphragms separated by a leak indicating spacer.
2. Fabricate internal metal parts included in the check assemblies of Series 300 stainless steel, and not containing dissimilar metals. Fabricate elastomeric seat discs on the check and relief valve to be reversible and seat rings of B-61 bronze, or Series 300 stainless steel. Fabricate the check assembly to be center stem guided at the seat ring and at the cover by replaceable non-corrosive bushings. Fabricate relief valve spring of Series 300 stainless steel.
3. Maximum head losses through the assembly: 12.5 psi at velocities from zero up to and including 7.5 fps. Document flow curves by independent laboratory testing.
4. Include flanged, full port resilient wedge shut-off valves and four vandal resistant ball valve test cocks, considered integral to the assembly. Factory assemble and backflow test the assemblies.
5. Febco 825, Conbraco 40-200, Cal-Val-Co RP-1 or FP-2, Wilkins or Watts 909.

2.3 CLEANOUTS

A. Products of Josam, Smith, Wade or Zurn equal to the Smith models listed.

B. Standard Duty Floor Cleanouts
1. Coated cast iron with adjustable top.
2. Provide a neoprene sealed internal plug, top as specified to suit floor finish and secured to plug by a counter sunk screw.
3. Provide tops as follows:
   a. Concrete floors - round, scoriated nickel bronze. Smith figure 4020.
   b. Asphalt tile, vinyl tile or linoleum floors - square, recessed top to receive tile, Smith figure 4160.
   c. Quarry or Ceramic Tile - square, scoriated nickel bronze. Smith figure 4040.

d. Terrazzo and similar poured floors - round, recessed top to receive flooring, Smith figure 4180.
e. Carpet - same as concrete floors plus a carpet marker. Smith figure 4020-Y

C. Heavy Duty Floor Cleanouts
1. Coated cast iron with round, scoriated, cast iron adjustable top, and neoprene sealed internal plug. Smith figure 4240.

D. Wall Access-Stack Cleanouts
1. Where stack cleanouts are furred into wall construction, provide a coated cast iron cleanout ferrule with internal recessed plug and spigot connection.
2. Covers:
a. Masonry, tile or gypsum wallboard - squared chromium-plated bronze frame and cover. Smith figure 4434.
b. Carpet wall finish - round stainless steel cover. Smith figure 4530

2.4 FLOOR DRAINS

A. General
1. Products as manufactured by Josam; Wade; Smith; or Zurn, equivalent to the Smith numbers listed.
2. Fabricate floor drain grates and buckets of cast metal, of the materials specified. Provide grates with reinforcement cast integrally, on the under side, to protect against "dishing".
3. Provide each floor drain with trap guard as manufactured by Zurn Elkay model Z1072 or approved equal.

B. Toilet, Shower and Locker Rooms
1. Smith series 2005-A5NB-BP, cast iron body and collar with double drainage flange, weepholes and 5-inch diameter nickel bronze strainer with sediment bucket and priming connection.

C. Janitor's Closets and Storage Rooms
1. Smith series 2310-B cast iron body with double drainage flange, weepholes, adjustable, 8-1/2-inch diameter top and grate with sediment bucket.

D. Heavy Traffic Areas
1. Smith series 2320 cast iron heavy duty drain body with double drainage flange, weepholes, adjustable 8-1/2-inch diameter top with deep set tractor grate. Smith series 2120 may be used where adjustable top is not required.

E. Mechanical Equipment Rooms
1. Smith series 2310-B cast iron body with double drainage flange, weepholes, adjustable, 8-1/2-inch diameter top and grate with sediment bucket. Smith series 2120-B may be used when adjustable top is not required.

2.5 FLOOR SINKS (FS-1)

A. General
1. Products as manufactured by Watts; Smith; or Zurn.
2. Fabricate floor drain grates and buckets of cast metal, of the materials specified. Provide grates with reinforcement cast integrally, on the under side, to protect against "dishing".

B. FS-1: 8-inch round and 6-inch deep cast iron sanitary floor sink with white acid resistant coated interior, loose set acid resistant coated cast iron grate (½ size), aluminum dome bottom strainer, ¾" steel grate and no hub outlet. Wade model FS-720.

2.6 TRAP PRIMER

A. Provide Precision Plumbing Products trap primer as indicated on drawings, or approved product of Josam, Wade or Zurn.

2.7 FIXED AIR GAP FITTINGS

A. Smith No. 3950 or 3955 or Josam Type No. 88900 or 88910.

2.8 MAIN ROOF DRAINS

Main roof drains consist of a standard roof drain and an overflow roof drain.

a. Standard roof drain: coated cast iron roof drains with large cast iron locking dome, non-puncturing clamp ring with integral gravel stop, adjustable top with roof flanges, large sump with anchor flange, and bottom outlet inside caulk, thread or no-hub connection. Provide drains in metal deck roofs with deck clamps.

Josam 21000
Smith 1015
Wade W-3010
Zurn Z-100-EA-Z

b. Secondary (Emergency) roof drain: coated cast iron roof drains with large cast iron locking dome, non-puncturing clamp ring with integral gravel stop, adjustable top with roof flanges, large sump with anchor flange, and bottom outlet inside caulk, thread or no-hub connection. Provide drains with 50-mm (2-inch) water dam. Provide drains in metal deck roofs with deck clamps.
Josam 21000
Smith 1080
Wade W-3000-D
Zurn Z-100-EA-C-89

2.1 AREA DRAINS (AD-1)

A. General
a. Infinity model SLT – 3836 low profile and 36” long.
b. 16 gauge, 304L stainless steel perforated grate
Modify length and outlet location on site with PVC channel.

PART 3 EXECUTION

3.1 ERECTION, INSTALLATION, APPLICATION

A. Cleanouts
2. Provide cleanouts as shown, specified, and at such other locations as required by the plumbing code.
3. Provide a cleanout at the base of each vertical soil, waste and storm stack.
4. Provide cleanouts the same size as the pipe with a maximum size of 4 inches. Cleanouts below floors up to floor level with bends and extensions as necessary so the cleanout plug is accessible and not covered with any permanent finishing material.

5. Provide cleanouts on horizontal soil, waste and drainage lines at their ends, at any change in direction of greater than 45 degrees, and at other points so that the distance between cleanouts does not exceed fifty feet in lines of 4-inch diameter or less and 100 feet for larger pipes.
6. Install floor cleanouts flush with floor surface.

B. Lead Flashing Pan
1. Provide 4 lb. minimum lead flashing pan around floor drains above the ground floor.
2. Coat lead flashing pan surfaces in contact with concrete, masonry or mortar, with a 12-14 mil thickness of bituminous paint.

3.2 DOMESTIC WATER SYSTEMS STERILIZATION

A. Scope.
1. Sterilize each unit of completed domestic water supply line and distribution system with chlorine before acceptance for operation.

B. Liquid Chlorine
1. Fed. Spec. BB-C-120.

C. Hypochlorite
1. Fed. Spec. O-C-114.

D. Method
1. Provide an amount of chlorine applied so as to provide a dosage of not less than 100 parts per million. Introduce the chlorinating material to the water lines and distribution systems in a manner approved by the Architect. After a contact period of not less than twenty four hours, flush the system with clean water until the residual chlorine content is not greater than that of the incoming fresh water.

E. Bacteriological Testing
1. After chlorination work is complete, provide a bacteriological analysis of a water sample, taken from a remote fixture in the system, performed by a state-approved testing agency.

F. Report
1. Provide sterilization test report

END OF SECTION

SECTION 22 05 02

TESTING OF PIPING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes.
1. This Section includes the provision of all labor material and equipment to test all the piping systems on the Project

1.2 REFERENCES

A. National Clay Pipe Institute (NCPI).
1. Clay Pipe Engineering Manual.

1.3 SYSTEMS DESCRIPTION

A. Performance Requirements.
1. Test all piping systems provided under Divisions 22 and 23.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Provide pumps, gages, valves, piping, flanges, blanks and other equipment and material necessary to properly conduct the tests. Check gages used for pressure tests against a dead weight tester and certify correct over the range of the gage.

B. Repair defects appearing during tests immediately with new material, at the Contractor's expense, and re-test the lines to prove elimination of defects.

PART 3 EXECUTION

3.1 PIPE TESTING

A. General Requirements.
1. Test and adjust all parts of each system and associated equipment to work properly and leave in good operating condition.
2. Notify the Architect in advance of all tests, so that the Architect may be represented at all tests, and determine that all tests are conducted to the Architect's entire satisfaction.
3. Repair or replace all defects disclosed in the work by tests or otherwise uncovered without additional cost to the Owner.
4. Repeat tests after any defects disclosed and repair or replace, if in the judgment of the Architect, it is deemed necessary.
5. Make all repairs to piping systems with new material. No caulking on screwed joints, cracks, or holes will be acceptable. Where it becomes necessary to replace pieces of pipe, make such replacement with the same lengths as the defective pieces.
6. Arrange for and pay the cost of all utilities used on tests.
7. Make all tests before piping is concealed and covering is applied.

8. Take all necessary precautions and protections required when testing to protect all devices, equipment and specialties when test pressures exceed the pressure testing limitations of such items.

3.2 ABOVEGROUND PIPE TESTING

A. General.
1. Include in the testing requirements for the respective piping systems, applicable governing codes and insurance company requirements, and those specified. Forward a copy of code-required plumbing inspection certificates for approval.
2. Make specified pressure tests as outlined below on piping included in this Contract. Make tests before piping is painted, covered, or concealed.
3. Ensure that joints on lines under liquid pressure remain drop dry for a period of one hour under test pressure. Ensure that exterior surface of pipe and fittings do not show cracks, other forms of leaks, or permanent deformation. Drain pipe, other than water pipe, completely after test.
4. Observe the tests after the pipe and contents have assumed ambient temperature and the source of the test pressure shut off.

B. Drainage Systems Testing.
1. Test plumbing and drainage systems according to the rules and regulations of applicable governing codes for plumbing and drainage work, and in the presence of the inspector or representative authorized to approve the installations.
2. In new construction, subject soil, waste, and vent piping in the drainage system to a water or air test. In replacements, repairs, or alterations of the drainage systems which can not reasonably be subjected to a water test, thoroughly flush the piping with water in the presence of the inspector until the inspector is satisfied that the installation is satisfactory in every respect.
3. Ensure that in any water or air test, the pressure specified remains constant for not less than fifteen minutes without further addition of water or air. Do not conduct water test when the temperature to which the piping is exposed is less than 20 degrees F.
4. Water test
   a. Tightly plug each opening of a section of the system except the highest opening of the section being tested, and fill each section with water. Do not test any section with less than a ten-foot head of water. In testing successive sections, retest at least the upper ten feet of the preceding section, retest so that no joint or pipe in the system shall have been submitted to a test of less than a ten-foot head of water. Eliminate air from the section being tested with water.
5. Air test
   a. Tightly close each opening of a section of the system. Attach an air compressor or test apparatus to a suitable opening and force the air into the drainage system until there is a uniform pressure of five psi on the entire section being tested.

C. Domestic Water Piping Testing.
1. Give the domestic hot and cold water distribution piping a hydrostatic test of one-and-one-half times the system operating pressure, maintain without pressure loss for one hour.

END OF SECTION

SECTION 22 05 05

IDENTIFICATION OF PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes.
1. This Section includes the provision of all labor, materials and equipment required to furnish and install piping and equipment identification in accordance with Contract Documents.

1.2 REFERENCES

A. American National Standards Institutes, Inc. (ANSI)
1. A13.1 - Scheme for Identification of Piping Systems.

1.3 SUBMITTALS

A. Samples
1. Submit Samples of colors for proposed pipe marker letters and fields in accordance with Section 01300.

PART 2 PRODUCTS

2.1 PIPING MARKERS

A. Provide pipe markers consisting of pipe contents identification name with flow direction arrows.

B. Pipe Markers
1. For piping up to 8-inch diameter (including insulation) provide pipe markers consisting of 9-mil-thick. Pre-manufactured snap-on plastic wrap-around type sized to cover entire circumference of piping and insulation. Brady USA, Inc. High Performance or equal product of Seton Nameplate Corp. or MSI Marking Services, Inc.
2. Labels to have integral color identification as established by ANSI Standard A13.1 - 1981. Lettering shall be sized to be easily legible. Directional arrows shall indicate direction of flow and shall be located to point away from lettering.

2.2 VALVE TAGS

A. Provide 40 mil thick, round brass valve identification tags for all valves. Provide the top line of each tag with 1/4-inch-high letters indicating the service designation (CHW, DCW etc.

B. Brady USA,Inc. B906 or equal product of Seton Nameplate Corp. or MSI Marking Services, Inc.

2.3 CEILING MARKERS

A. Provide ceiling markers consisting of color coded dots equal to Brady USA, Inc. Series 23250 or approved product of Seton Nameplate Corp. or MSI Marking Services, Inc.

2.4 DUCTWORK IDENTIFICATION

A. Printed label bearing the name of the:
1. Service.

2. System designation.
3. Direction of flow

B. Letter size: 3-1/2 inches.

C. Letter type: Gothic bold style.

D. Lettering designations and color scheme:
1. Supply air: White letters on blue background.
2. Return air: Black letters on green background.
3. Relief air: Black letters on green background.
4. Exhaust: Black letters on yellow background.

E. Minimum length of label: 24 inches.

F. Self sticking indoor/outdoor vinyl markers: Brady USA, Inc. B-946 or equal product of Seton Nameplate Corp. or MSI Marking Services, Inc.

2.5 EQUIPMENT IDENTIFICATION

A. Identify all equipment installed under this Division with 2-inch-high Gothic vinyl film black letters or numbers with permanent adhesive and conforming to the equipment designation identification shown on the Drawings: Brady USA, Inc. B-933 or equal product of Seton Nameplate Corp. or MSI Marking Services, Inc

PART 3 EXECUTION

3.1 INSTALLATION OF PIPE MARKERS

A. Identify the content and directional flow of all piping on the Project with the specified pipe markers.

B. Provide pipe marking that complies with ANSI A13.1 with respect to:
1. Letter color.
2. Letter size.
3. Background color.
4. Marker size (length)

C. Install pipe markers at the following pipe locations:
1. Adjacent to each valve.
2. At each change in direction.
3. At each branch connection.
4. Where pipe penetrates walls, ceilings, and floors.
5. Every 20 feet on horizontal and vertical pipe runs

D. Apply markers after insulating and/or painting have been completed.

E. Where a service is indicated on the Drawings as a circulating system, provide the pipe marker legend for the particular service with the word "supply" or "return" as required to clarify the line function.

3.2 INSTALLATION OF VALVE TAGS

A Attach tags to all valves using a #16 brass jack chain.

3.3 INSTALLATION OF CEILING MARKERS

A Where valves, traps, dampers, control boxes, and other such devices occur above accessible suspended ceilings, provide 7/8-inch-diameter, color coded, ceiling, dot type marks in the ceiling tile where devices occur above.

3.4 APPLICATION OF DUCT LABELS

A Label all ductwork as indicated above. Label ductwork in exposed areas including mechanical rooms and in accessible shafts and chases.

B Label straight runs a maximum of 50 feet on center; label branch ductwork within 3 feet of mains; label at each change in direction; label within 3 feet of each wall, floor, roof or ceiling penetration.

3.5 APPLICATION OF EQUIPMENT LABELS

A Apply equipment labels on a prominent surface of the equipment where they can be readily seen from the operating floor.

3.6 PIPE IDENTIFICATION SCHEDULE

A Provide pipe identification markers in accordance with the following schedule:

Service	Background Color	Colors of Letters
Water:		
Domestic cold water	Green	White
Domestic hot water	Yellow	Black
Deionized water	Green	White
Heating hot water	Yellow	Black
Industrial cold water	Green	White
Industrial hot water	Yellow	Black
Chilled water	Green	White
Cooling water	Green	White
Steam & Condensate		
Steam	Yellow	Black
Condensate	Yellow	Black
Laboratory Gases:		
Vacuum	Blue	White
Compressed air	Blue	White
Fuels:		
Natural gas	Yello	Black
Building Drainage Systems:		
Sanitary waste	Green	White
Acid waste	Yellow	Black

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes the thermal insulation for heated and cooled mechanical equipment, piping and ductwork provided in other Sections of Division 22.

1.2 REFERENCES

A. American Society of Testing and Materials (ASTM).
1. C177 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
2. C335 - Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
3. C356 - Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.
4. C411 - Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
5. C518 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
6. C533 - Specification for Calcium Silicate Block and Pipe Thermal Insulation.
7. C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Insulation in Sheet and Tubular Form.
8. C547 - Specification for Mineral Fiber Preformed Pipe Insulation.
9. C553 - Specification for Mineral Fiber Blanket and Thermal Insulation for Commercial and Industrial Applications.
10. C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
11. C795 - Specification for Wicking - Type Thermal Insulation for Use Over Austenitic Stainless Steel.
12. C1136 - Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
13. D1056 - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
14. D1149 - Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber.
15. E84 - Test Method for Surface Burning Characteristics of Building Materials.
16. E119 - Method for Fire Tests of Building Construction and Materials.
17. E96 - Test Method for Water Vapor Transmission Materials.
18. E136 - Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

B. Midwest Insulation Contractors Association (MICA)
1. National Commercial and Industrial Insulation Standards.

C. National Fire Protection Association (NFPA)
1. 90A -Standard for Installation of Air-Conditioning and Ventilating Systems.
2. 90B - Installation of Warm Air Heating and Air Conditioning Systems.

D. Underwriters Laboratories Inc. (UL)790 - Test for Fire Resistance of Roof Covering Materials.

1.3 DEFINITION OF LOCATIONS SCHEDULE

A. Finished and Unfinished Areas.
   1. "Finished areas" are areas where floor, walls, ceilings, trim, or exposed steel are painted, tiled, or similarly finished.
   2. "Unfinished areas" are areas with unpainted walls.

B. Exposed and Concealed Areas.
   1. "Exposed areas" are finished areas and other areas used by personnel in the normal use of the building, such as boiler room, fan rooms, mechanical rooms, and storage rooms.
   2. "Concealed areas" are pipe tunnels, covered pipe trenches, spaces inside walls, duct or pipe shafts, spaces above dropped ceilings, unfinished attic spaces, crawl spaces, and space below access floor.

1.4 SYSTEMS DESCRIPTIONS

A. Design Requirements.
   1. Heated piping systems
      a. Heated systems piping to be insulated:
         (1) Domestic hot water supply and return.
         (2) Domestic hot and cold water angle valve assemblies and drain piping exposed under lavatories for the handicap.
      b. Heated piping systems and components not to be insulated:
         (1) Vents to atmosphere, discharges from safety and relief valves, except where burn protection for operating personnel dictates.
         (2) Overflow and drain lines from heating equipment.
         (3) Trap assemblies, including strainers, valves, traps, and unions and the piping from the drip let to the trap.
         (4) Exposed chromium-plated piping to plumbing fixtures. (Except at lavatories for the handicap.)
         (5) Concealed vertical domestic hot water drops to individual plumbing fixtures within non-masonry interior partitions.
         (6) Unions in all locations.

1.5 SUBMITTALS

A. Submit description, heat transfer coefficients, characteristics, and compliance with specified flame spread and smoke development ratings for insulation, jackets and adhesives on insulated systems.

B. Submit schedules of thicknesses for each insulated system, including each pipe size for each insulated piping system.

C. Submit Samples of each type of insulation and insulation system proposed for use on the Project.

D. Refer to Div. 1

1.6 WARRANTY

A. Refer to Section Div. 1.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide insulation, binders, jackets, adhesives, coatings, tapes and sealers furnished under this Section which are listed and labeled by Underwriters Laboratories Inc. and have a flame spread rating of 25 or less and smoke development rating of 50 or less when tested in accordance with ASTM E84, unless otherwise specified. (Elastomeric cellular pipe insulation shall comply only for thicknesses less than 1-inch.)

B. Provide pipe insulation in pre-molded, three-or-six-foot long sections, split ready for application.

C. Do not use wheat paste, mold-breeding and mold-sustaining organic materials.

D. Provide insulation materials which are 100 percent asbestos free.

2.2 MANUFACTURERS

A. Fiberglass Insulation: Owens-Corning Fiberglas Corporation; Manville; Certainteed Corp.; Keene Building Products Corp; Armstrong World Industries, Inc.; Manson Insulation, Inc.; or Knauf Fiber Glass.

B. Elastomeric cellular thermal pipe insulation: Armstrong "AP Armaflex"; Accessible Products Co. "Techlite"; Halsted "Insultube"; or Insulation Materials Corporation of America (IMCOA) Imcolock or Imcoshield.

C. Adhesives, mastics, coatings and sealants: Foster Products Div., H.B. Fuller Co.; I-C Adhesives Co.; Chicago Mastic Co.; Childers Products Co. or St. Clair Rubber Co.; and as specified in Part 3 - Execution.

2.3 PIPE INSULATION

A. Glass fiber, pre-formed, rigid, molded insulation with vapor retardant jacket consisting of white Kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, with self-sealing longitudinal laps and butt strips. Provide insulation with a thermal conductivity 'k' of 0.23 BTU /(hr) (sq. ft.) (degree F/in.) at 75 degrees F mean temperature and a maximum service temperature of 850 degrees F. Provide insulation and jacketing conforming to the following standards:
ASTM C335 ASTM C547
ASTM C356 ASTM C795
ASTM C411 ASTM C1136
ASTM C518

B. Pipe Insulation Minimum Thickness
1. Domestic Hot water and return piping
1" thickness
2. Condensate drain piping from cooling coils:
½” thickness.

2.4 HANDICAPPED LAVATORY PIPE INSULATION

A. Cover P-trap and angle value assemblies under handicapped laboratories with a fully molded closed cell vinyl insulation. Provide Truebro, Inc. “Handi Lav-Guard” insulation kit, model #102, furnished in a gray color. Provide covering with hinged caps for angle valve access, weephole at clean-out nut and nylon fasteners to secure assembly in place.

PART 3 EXECUTION

3.1 GENERAL APPLICATION REQUIREMENTS

A. Install insulation, adhesives, coatings, mastics, sealants and tapes, only by experienced pipe coverers, in compliance with MICA standards.

B. When building structures or equipment interfere with the insulation, coordinate installation with other trades.

C. Protect work of other trades from debris caused by the insulation work. Remove debris daily.

D. Provide removable sections of insulation or insulation boxes at all points where access is required. Assemble sections and boxes and install so disassembly, removal, and replacement will not damage the insulation.

E. Provide a minimum of 1/4-inch-thick coverage over sheet metal joints and stiffeners.

F. Do not insulate nameplates.

G. Provide insulation support on vertical piping, duct and equipment on maximum 12-foot spacing. Supports shall project 1/2-inch less than insulation thickness.

H. Clean surfaces to be insulated, and make dry and free of loose scale, rust, dirt, oil and water before insulation, adhesives or mastics are applied.

I. Install insulation smooth and clean. Make joints tight and finished smooth. Do not use cracked, chipped, or torn insulation sections in the Work.

J. Provide thickness of the insulation the maximum specified or shown.

K. Make joints tight with insulation lengths and segments tightly butted against each other. Where lengths or segments are cut, make cuts smooth and square and without breakage of end surfaces.

L. Apply outdoor aluminum weatherproof covering over insulation in such a manner as to be entirely weatherproof and watertight

M. Make up joints with the proper system adhesive and three-inch-wide (minimum) tape of same material as the jacket.

N. Position longitudinal joints on the bottom of the pipe.

O. Where vapor barrier jackets are used on cold surfaces, apply insulation with vapor seal integrity maintained throughout the entire system.

P. Fit insulation tightly against surface to which it is applied.

Q. Do not apply sealant or cement until previous applications of adhesives and cement have thoroughly dried.

R. Conduct required tests on piping, equipment and ductwork, and make corrections, if required, prior to application of insulation.

S. Apply insulation so as to permit expansion and contraction of pipe lines without causing damage to insulation or surface finish.

T. Provide premolded pipe insulation with extended leg when used on pipes heat-traced with piping or cable.

U. Insulate all flanges on both cold and hot piping systems, including bonnet flanges on valves; insulate valves up to the gland. Provide insulation on flanges with overlap of the adjacent pipe covering by two inches and pack the void space with insulation and finish with insulating cement.

V. For equipment insulated with fiberglass insulation in mechanical equipment rooms or in finished spaces, finish with Zeston, Proto or Ceel-Co jacketing and fitting covers or aluminum jacketing.

W. Extend duct insulation on air conditioning supply air systems up to and around the supply air diffuser body.

X. Run pipe insulation and vapor barrier jackets continuous through sleeves and openings in walls and floors.

Y. Insulate pipe line strainers and provide with removable insulation boxes over the basket cover flange.

Z. Restore existing insulation and surface finishes disturbed or damaged during the course of the work to original condition.

AA. Provide insulation jackets as specified.

BB. Provide insulated surfaces ready to receive a final coat of paint without the necessity of sizing or priming.

3.2 PIPING SYSTEMS APPLICATION

A. Joints.
1. Secure longitudinal joints with self-sealing laps (SSL). Secure transverse joints with self-sealing butt strips. Provide butt strips a minimum of three inches wide

B. Fittings
1. Provide Zeston 2000, Proto or Ceel-Co, PVC one piece, molded fitting covers on all pipe fittings, flanges, valves and pipe terminations. Install covers that have a maximum of 20-mil thickness and have a flame spread rating of 25 or less and a smoke developed rating of 50 or less per ASTM E84.
2. Insulate fittings by applying a factory pre-cut insulation insert to the fitting, tucking the ends of the insert snugly into the throat of the fitting and the edges adjacent to the pipe insulation.
3. On heated piping systems, apply the PVC fitting cover and secure by fastening, banding and taping the ends to the adjacent pipe insulation.
4. On cooled piping systems, apply a vapor retarder mastic around the edges of the adjoining pipe insulation and on the fitting cover throat overlap seam. Apply the PVC fitting cover and secure with pressure sensitive tape along the circumferential edges. Extend the tape over the adjacent pipe insulation and have an overlap of at least two inches.
5. On fittings where the pipe insulation thickness exceeds 1-1/2-inches, apply two or more insulation inserts prior to the installation of the PVC fitting cover. Apply the first layer with several wrappings of fiberglass yarn to eliminate voids and hot

spots. Apply one additional insert for each 1-inch of pipe insulation above 1-1/2-inches.

C. Abutting Insulated Pipe Supports:
   1. Insulated pipe supports are provided under Section 22 05 00, paragraph "Hangers and Supports".
   2. When abutting these supports on hot pipe, apply a 3-inch wide vapor barrier tape or band over the butt joint.
   3. When abutting these supports on cold pipe, apply a wet coat of vapor barrier lap cement on all butt joints and seal joints with a minimum of 3-inch-wide vapor barrier tape or band

D. Roof Drains and Sumps.
   1. For roof drains, sumps and sump pans, cover portions below roof deck with one-inch-thick mitered segments of flexible fiberglass insulation, fastened with stainless steel bands. Point with insulating cement and allow surface to dry. Apply a 1/16-inch wet film thickness brush coat of vapor barrier coating: Foster 30-35 or Childers Products Encacel V embedding 10 x 10 mesh glass fabric in surface finish coat. At Contractors option, glue 1/2-inch flexible eleastomeric sheet to roof drain body/slump and mastic.

E. Insulation Protection.
   1. For pipe insulated with fiberglass insulation exposed in mechanical equipment rooms or in finished spaces below 10 feet above finished floor, finish with Zeston 2000, Proto or Ceel-Co jacket fitting covers or aluminum jacket.

END OF SECTION

SECTION 22 08 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Faucets and aerators.
2. Water closets.
3. Lavatories
4. Urinals.
5. Counter Sinks
6. Service Sinks

1.2 SUBMITTALS

A. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
1. Local/Regional Materials:
a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
2. Water efficiency: Indicate water consumption rates in gallons per day (gpd) per unit for the following:
a. Plumbing fixtures

B. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.

1.3 QUALITY ASSURANCE

A. Water flow and consumption rates for plumbing fixtures:
1. Comply with requirements in Public Law 102-486, Energy Policy Act.
2. Provide WaterSense labeled products for:
a. High-Efficiency Lavatory Faucets.
b. High-Efficiency Toilets - Tank-Type Single Flush.
c. Flushing Urinals

PART 2 PRODUCTS

2.1 MATERIALS

A. Fixtures:

1. Water management: Provide low flow fixtures and automatic, sensor operated faucets and flush valves. Provide automatic, sensor operated faucets and flush valves to comply with ASSE 1037 and UL1951.
   a. Faucets and aerators: WaterSense labeled. Maximum 1.5 gal/min when measured at a flowing water pressure of 60 pounds per square inch; and, minimum flow rate shall not be less than 0.8 gpm (3.0 L/min) at a pressure of 20 psi at the inlet, when water is flowing.
   b. Water closets: WaterSense labeled high-efficiency toilet with maximum effective flush volume of 1.28 gallons. For single flush toilets, the effective flush volume is the average flush volume per ASME A112.19.2.
2. Toxicity/IEQ
   a. Traps: Provide traps with removable access panels for easy clean-out at sinks and lavatories.
   b. Water filter systems: Provide filters for chorine at sinks, lavatories, and showerheads.
   c. Low corrosion flux for copper pipe: Comply with ASTM B813

2.2 ACCESSORIES

A Labels: Provide labels for sensor operators at flush valves and faucets. Include the following information on each label:
1. The identification of the sensor and its operation with graphic description.
2. Range of sensor.
3. For battery operated units, the battery replacement schedule

2.3 WC-1 WATER CLOSET

Fixture: American Standard 2876.100 “Yorkville” floor mounted, back outlet, standard height rim, vitreous china, elongated bowl with pressure assisted siphon jet flushing action, 2-1/8” fully glazed trapway, Everclean antimicrobial surface, close-coupled toilet combination with bolt caps, 1.1 GPF consumption.

Supply: Eastman PI5812RE-14ALF-WC 5/8” x 3/8” OD chrome plated, Lead Free, quarter turn ball valve style angle stop with 12” semi-rigid chrome-plated riser tube and chrome plated escutcheon.

Supply: Eastman PI5812SE-14ALF-WC 5/8” x 3/8” OD chrome plated, Lead Free, quarter turn ball valve style angle stop with 12” flexible stainless steel riser tube and chrome plated escutcheon.

Seat: American Standard 5901.110T elongated, heavy duty white open front seat with self stainless steel check hinge and EverClean antimicrobial surface. No cover.

2.4 WCH-1 ADA WATER CLOSET

Fixture: American Standard 2878.016 “Yorkville” floor mounted, back outlet, 16-1/8” to rim, A.D.A. compliant, vitreous china, elongated bowl with pressure assisted siphon jet flushing action, 2-1/8” fully glazed trapway, close-coupled toilet combination with bolt caps, 1.6 GPF consumption.

Supply: Eastman PI5812RE-14ALF-WC 5/8” x 3/8” OD chrome plated, Lead Free, quarter turn ball valve style angle stop with 12” semi-rigid chrome-plated riser tube and chrome plated escutcheon.

Supply: Eastman PI5812SE-14ALF-WC 5/8” x 3/8” OD chrome plated, Lead Free, quarter turn ball valve style angle stop with 12” flexible stainless steel riser tube and chrome plated escutcheon.

Supply: Eastman PI5812RE-14LKLF-WC 5/8” x 3/8” OD chrome plated, Lead Free, loose key, quarter turn ball valve style angle stop with 12” semi-rigid chrome-plated riser tube and chrome plated escutcheon.

Supply: Eastman PI5812SE14LKLF-WC 5/8” x 3/8” OD chrome plated, Lead Free, loose key, quarter turn ball valve style angle stop with 12” flexible stainless steel riser tube and chrome plated escutcheon.

Seat: American Standard 5901.110T elongated, heavy duty white open front seat with self stainless steel check hinge and EverClean antimicrobial surface. No cover.

2.5 LAV-1 WALL HUNG LAVATORY

Fixture: American Standard 0355.012.020 Lucerne, Wall Hung Lavatory with Backsplash wall mounted, vitreous china lavatory with D-shaped bowl, front overflow, self-draining deck area with contoured back and side splash shields, concealed wall hanger and single hole faucet hole drilling. Drilled for concealed armchair carriers. ADA compliant.

Supply Fitting: Chicago Faucet 410-E2805ABCP, deck-mounted manual sink faucet, single-hole mount with accessory plates available. Vandal Proof Pressure compensating Econo-Flo™ non-aerating laminar spray 0.5 GPM ECAST® design provides durable construction with total lead content equal to or less than 0.25% by weighted average.

Tempering Valve: Bradley S59-4000A “Navigator”thermostatic water mixing valve shall consist of a piston control mechanism and wax-filled thermostatic control element. Valve shall include 3/8” compression fittings and S45-2456 mounting bracket. Unit shall have adjustable temperature control and shall be set at 105°F outlet temperature with a capacity of 2.5 GPM flow @ 10 PSI pressure drop. Valve shall comply with ASSE 1070 point-of-use standards and be certified by IAPMO to meet the lead-free requirements of CA AB 1953.

Drain: Eastman 35072 cast brass drain with integral perforated grid and 1-1/4” x 8” tailpiece.

Supplies: Eastman PI5816RE-14ALF-2 5/8” x 3/8” OD Lead Free, chrome plated quarter turn ball valve style angle stops with 15” chrome-plated, semi-rigid riser tubes and chrome plated escutcheons. Certified to NSF/ANSI Standard 61-G Section 9.

Trap: Eastman 35020 17 gauge 1-1/4" x 1-1/4" semi-cast brass P-trap with cleanout.

Insulation: Plumberex2003W “Handy-Shield Maxx” under-lavatory insulation of all exposed drainage piping including hot, cold and tempered water supplies. Product shall meet ADA and ICC/ANSI A117.1. Insulation material shall comply with ASTM E 84-07/ UL 723 Class A and shall be listed and meet UPC/IAPMO. Insulation material shall be U/V inhibited with antimicrobial and antifungal properties.

Carrier: Watts Drainage TCA-411 epoxy coated floor mounted concealed arm track lavatory carrier with heavy gauge steel offset uprights with welded feet, steel cross plate

with integral mounting brackets, sliding adjustable arm brackets and adjustable cast iron concealed arms with mounting clips, leveling screws and basin locking device.

2.6 SH-1 ADA SHOWER

Fixture: Aquabath C413684BF-OT-FUS 3/4" one piece cast acrylic, A.D.A. compliant shower with open top, 3/4" threshold (41” x 37” x 82-3/4” O.D. - 36” x 36” I.D.) and shall meet ANSI Z124.2. Unit shall have a backside flame spread of less than 30 (Class B). The unit shall be reinforced with a fiberglass strand/polyester resin mix. Shower shall be furnished with integral recessed trench system to direct water to the center drain and an anti-skid floor treatment to meet performance requirements of ASTM F-462, and shall also conform with ANSI A-117.1, ADA and NAHB Listed. Unit shall include the following factory installed items: S.S. grab bar, "L" shaped phenolic fold up seat, soap dish insert and 1" S.S. curtain rod. Factory supplied (field installed) equipment shall include self-caulking brass shower drain with stainless steel strainer and weighted shower curtain, antibacterial, with hooks. Acrylic shell shall have a limited ten (10) year warranty.

Hand Shower & Hose System: American Standard TU662.211 complete commercial shower system including; RU101SS pressure balance shower valve body, Reliant 3 valve trim, wall supply, 59” hose, inline vacuum breaker, 3-function water saving personal shower (1.5 GPM) and 36” slide bar. Valve shall be cast brass body with washerless ceramic disc cartridge with volume and temperature control and hot limit stop. Shower valve shall comply with ASME A112.18.1, ASSE 1016, ANSI A117.1, CSA B 125 standards and ADA standards.

Shower Control Valve: Powers e710-0-0-0-L-0-W thermostatic & pressure balancing shower valve with integral checkstops, high limit stop, C.P. metal trim, 30” slide bar, 60” metal hose, Low Flow (1.5 GPM) hand shower and inline vacuum breaker. ASSE 1016 and IAPMO UPC Listing. (Five-year warranty on internal tempering mechanism).

Shower Head and Control Valve: Bradley 1C-HD-SB pressure balancing shower valve shall be constructed from brass and stainless steel, including stainless steel cartridge and balancing piston, 1/2" chrome plated brass stem, cast-in limit stops and hot temperature limit screw, vandal resistant ADA compliant lever handle and integral checkstops. Valve shall be factory assembled and tested, ASSE 1016 certified and include 60" flexible hose, 24" metal slide bar, vacuum breaker and quick disconnect and shall meet ANSI A112.18.1M flow requirements of 2.5 GPM.

Trench Drain: BLÜCHER BWC-136 AISI Type 304 stainless steel 3-1/4" wide x 36” long “Waterline” shower channel with membrane clamp, ADA compliant Vienna grating (standard), and no hub bottom outlet.

2.7 KS-1 KITCHEN THREE-COMPARTMENT SINK

Three compartment gauge 18 304 stainless steel 3-compartment sink as manufactured by Advanced Tabco model FC-3-1515-15RL. Provide sink with kitchen faucet with pre=rinse.

Supplies: Eastman PI15820RE-14ALF-2 5/8” x 3/8” OD Low Lead, chrome plated quarter turn ball valve style angle stops with 20” chrome plated semi-rigid riser tubes and chrome plated escutcheons. Certified to NSF/ANSI Standard 61-G Section 9.

Strainer: Eastman 30002 chrome plated cast brass crumb cup strainer with stainless steel basket and brass slip joint nut. Furnish with 1-1/2" x 6" tailpiece.

Trap: Eastman 35022 17 gauge 1-1/2" x 1-1/2" semi-cast brass P-trap with cleanout.

2.8 KS-2 KITCHEN TWO-COMPARTMENT SINK

Fixture: Advance Tabco FE-2-1812-18RL 72" 2 Compartment Sink w/ 18"L x 18"W Bowl, 12" Deep. Provide with kitchen faucet with pre-rinse.

Supplies: Eastman PI15820RE-14ALF-2 5/8” x 3/8” OD Low Lead, chrome plated quarter turn ball valve style angle stops with 20” chrome plated semi-rigid riser tubes and chrome plated escutcheons. Certified to NSF/ANSI Standard 61-G Section 9.

Strainer: Eastman 30031 type 304 stainless steel flat grid strainer with brass slip joint nut. Furnish 1-1/2” x 6” sink tailpiece.

2.9 COUNTER SINK Counter Sink S-1

Just model SLX-17519-A-GR or equal product of Elkay. 480 mm (19 inches) long by 450 mm (18 inches) wide by 190 mm (7-1/2 inches) deep, 18 gage, type 302 stainless steel, self-rimming, counter-top sink with 44-mm (1-3/4-inch coved corners, bowl and faucet deck recessed 5 mm (3/16 inch) below outside edge, satin finish, two faucet hole, fully undercoated and drain opening to accommodate waste disposal specified. Provide an additional hole punched 6” off center to the right for future R.O. dispenser. Furnish chrome plated faucet hole cover.

Faucet: Chicago Faucet 201-AGN8AE35-317CP 8" fixed centers, 8" rigid/swing gooseneck spout. Pressure compensating Softflo aerator. Vandal Proof 4" wristblade handles. Quaturn compression operating cartridge, left-hand. Quaturn compression operating cartridge, right-hand. ADA ANSI/ICC A117.1

Eastman PI15820RE-14ALF-2 5/8” x 3/8” OD Low Lead, chrome plated quarter turn ball valve style angle stops with 20” chrome plated semi-rigid riser tubes and chrome plated escutcheons. Certified to NSF/ANSI Standard 61-G Section 9.

Strainer: Eastman 30002 chrome plated cast brass crumb cup strainer with stainless steel basket and brass slip joint nut. Furnish with 1-1/2" x 6" tailpiece.

2.10 UTILITY SINK S-2

Sturdibilt® Stainless Steel 27" x 27-1/2" x 14" Floor Mount Single Compartment 2-Hole Scullery Sink. Sink is manufactured from 14-gauge 304 Stainless Steel with a Buffed Satin finish, Center drain placement. Sinks supported by (4) 16-

gauge stainless steel, 1-5/8” O.D. tubular legs with bullet shaped feet adjustable up to 1.

.

Faucet: Chicago Faucet 540-LDABCP 8" fixed centers, 8" rigid/swing gooseneck spout. Pressure compensating Softflo aerator. Vandal Proof 4" wristblade handles. Quaturn compression operating cartridge, left-hand. Quaturn compression operating cartridge, right-hand. ADA ANSI/ICC A117.1

Eastman PI15820RE-14ALF-2 5/8” x 3/8” OD Low Lead, chrome plated quarter turn ball valve style angle stops with 20” chrome plated semi-rigid riser tubes and chrome plated escutcheons. Certified to NSF/ANSI Standard 61-G Section 9.

Strainer: Eastman 30002 chrome plated cast brass crumb cup strainer with stainless steel basket and brass slip joint nut. Furnish with 1-1/2" x 6" tailpiece.

Plaster Trap: JR smith #873-t0150, removable sediment bucket with removable screen.

2.11 COUNTER SINK S-3

Fixture: Elkay model LRADQ172055, 17” x 20” x 5-1/2” deep 18-gauge, type 304 stainless steel, single bowl sink with fitting ledge, 3-hole faucet punching and mounting hardware.

Supply Fitting: Chicago Faucet model 116.427.AB.1, touchless faucet, single hole, 1.5 gpm laminar control insert in spout, vandal resistant handle and 0.5 GPM vandal resistant aerator. Faucet shall contain less than 0.25% total lead content by weighted average and shall comply with ADA standards. Provide with laminar flow aerator.

Supplies: Eastman PI15820RE-14ALF-2 5/8” x 3/8” OD Low Lead, chrome plated quarter turn ball valve style angle stops with 20” chrome plated semi-rigid riser tubes and chrome plated escutcheons. Certified to NSF/ANSI Standard 61-G Section 9.

Strainer: Eastman 30002 chrome plated cast brass crumb cup strainer with stainless steel basket and brass slip joint nut. Furnish with 1-1/2" x 6" tailpiece.

Trap: Eastman 35022 17 gauge 1-1/2" x 1-1/2" semi-cast brass P-trap with cleanout.

2.12 COUNTER SINK S-4

Fixture: Just model SLX-17519-A-GR or equal product of Elkay. 480 mm (19 inches) long by 450 mm (18 inches) wide by 190 mm (7-1/2 inches) deep, 18 gage, type 302 stainless steel, self-rimming, counter-top sink with 44-mm (1-3/4-inch coved corners, bowl and faucet deck recessed 5 mm (3/16 inch) below outside edge, satin finish, two faucet hole, fully undercoated and drain opening to accommodate waste disposal specified. Provide an additional hole punched 6” off center to the right for future R.O. dispenser. Furnish chrome plated faucet hole cover.

Provide with laminar flow aerator.

Supply Fitting: Chicago Faucet 201-AGN8AE35-317CP 8" fixed centers, 8" rigid/swing gooseneck spout. Pressure compensating Softflo aerator. Vandal Proof 4" wrist blade handles. Quaturn compression operating cartridge, left-hand. Quaturn compression operating cartridge, right-hand. ADA ANSI/ICC A117.1

Supplies: Eastman PI15820RE-14ALF-2 5/8” x 3/8” OD Low Lead, chrome plated quarter turn ball valve style angle stops with 20” chrome plated semi-rigid riser tubes and chrome plated escutcheons. Certified to NSF/ANSI Standard 61-G Section 9.

Strainer: Eastman 30031 type 304 stainless steel flat grid strainer with brass slip joint nut. Furnish 1-1/2” x 6” sink tailpiece.

Trap: Eastman 35022 17 gauge 1-1/2" x 1-1/2" semi-cast brass P-trap with cleanout.

2.13 MS-1 MOP SINK

Fixture: Fiat MSB3624 molded stone, 36" x 24" x 10" mop sink basin with integral drain. The unit shall have 10” high walls with not less than 1” wide shoulders. Unit shall include stainless steel drain body for caulk connection or quick connector, dome strainer and lint basket.

Supply Fitting: American Standard 8354.112 chrome-plated service sink faucet with vacuum breaker, ceramic disc cartridges, integral stops, adjustable wall brace, pail hook and 3/4" hose thread on spout. Body inlets adjustable from 6" to 10” centers, lever handles. Center spout outlet from center of faucet body 6-1/8".

Hose: Fiat 832AA, 30" heavy-duty, flexible 3/4" rubber hose and hose bracket.

Sealant: Fiat 833AA silicone sealant installed in accordance with manufacturer's recommendations.

Mop Hanger: Fiat 889-CC, 18 gauge, Type 302 stainless steel mop hanger.

2.14 HS-1 HAND-SINK IN KITCHEN

Fixture: Elkay model EHS-18-SSX Stainless Steel 18" x 14-1/2" x 11" 18 Gauge Hand Sink with Dual Side Splashes and Faucet

Supplies: Eastman PI15820RE-14ALF-2 5/8” x 3/8” OD Low Lead, chrome plated quarter turn ball valve style angle stops with 20” chrome plated semi-rigid riser tubes and chrome plated escutcheons. Certified to NSF/ANSI Standard 61-G Section 9.

Strainer: Eastman 30031 type 304 stainless steel flat grid strainer with brass slip joint nut. Furnish 1-1/2” x 6” sink tailpiece.

Trap: Eastman 35022 17 gauge 1-1/2" x 1-1/2" semi-cast brass P-trap with cleanout.

2.15 DF-1 BI-LEVEL WATER COOLER

Fixture: Fixture: Elkay EZH20 Enhanced Water Bottle Refilling Station, Bi-Level, Filtered, wall mounted split-level ADA compliant electric water cooler with stainless steel top and light gray granite finish on cabinet. Unit shall include electronic front bubbler push-bar, glass filler prepped, Flexi-Guard safety bubbler. Capacity of 8.0 GPH; 90°F ambient air temperature at 80°F inlet water temperature, 50°F outlet temperature. Drinking fountain shall comply with ANSI A117.1 and ADA standards and shall be certified to NSF/ANSI Standard 61 & 372 (lead free).

Compressor: Hermetically sealed, 115 volts with capacitor and overload protection. Cooler manufacturer shall provide a 5-year replacement warranty on the compressor and sealed refrigeration system.

Supply: Eastman PI5816SE-14ALF-1 5/8” x 3/8” OD Low Lead chrome plated quarter turn ball valve style angle stop with 16” flexible riser tube and escutcheon. Certified to NSF/ANSI Standard 61-G Section 9.

Trap: Eastman 35020 17 gauge 1-1/4" x 1-1/4" semi-cast brass P-trap with cleanout.

PART 3 EXECUTION

3.1 SITE ENVIRONMENTAL PROCEDURES

A Resource Management

1. Water Efficiency: Verify equipment is properly installed, connected, and adjusted. Verify that equipment is operating as specified.
   a. Adjust automatic sensor operated faucets and valves in accordance with manufacturer's instructions. Comply with ASHRAE 90.1 for energy efficiency.

END OF SECTION

SECTION 22 11 13

PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes pipe and pipe fittings that are common to more than one Section of Divisions 22 and 23.

B. Refer to the other sections of Divisions 22 and 23 and the Drawings to determine the extent of the required Work.

1.2 REFERENCES

A. American Society of Mechanical Engineers (ASME).
1. B1.20.1 - Pipe Threads, General Purpose (Inch).
2. B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
3. B16.3 - Malleable Iron Threaded Fittings.
4. B16.5 - Pipe Flanges and Flanged Fittings.
5. B16.9 - Factory-Made Wrought Steel Buttwelding Fittings.
6. B16.11 - Forged Steel Fittings, Socket-Welding and Threaded.
7. B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
8. B16.24 - Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
9. B18.2.1 - Square and Hex Bolts and Screws - Inch Series.
10. B18.2.2 - Square and Hex Nuts (Inch Series).
11. B18.22.1 - Plain Washers.
12. B31.1 - Power Piping.
13. B31.3 - Process Piping.
14. B31.5 - Refrigerant Piping.
15. B36.10M - Welded and Seamless Wrought Steel Pipe.

B. American National Standards Institute (ANSI)
1. B1.10 - Unified Miniature Screw Threads
2. B11.15 - Pipe, Tube, and Shape Bending Machines, Safety Requirements for Construction, Care, and Use.

C. American Society for Testing and Materials (ASTM)
1. A47 - Specification for Ferritic Malleable Iron Castings.
2. A47M - Specification for Ferritic Malleable Iron Castings [Metric].
3. A53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
4. A74 - Specification for Cast Iron Soil Pipe and Fittings.
5. A105/A105M - Specification for Forgings, Carbon Steel, for Piping Components.
6. A126 - Specifications for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
7. A181/A181M - Specification for Forgings, Carbon Steel, for General-Purpose Piping.
8. A182/A182M - Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
9. A183 - Specification for Carbon Steel Track Bolts and Nuts.
10. A193/A193M - Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

11. A194/A194M - Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
12. A216/A216M - Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
13. A234/A234M - Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
14. A269 - Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
15. A307 - Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
16. A312/A312M - Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
17. A403/A403M - Specification for Wrought Austenitic Stainless Steel Piping Fittings.
18. A536 - Specification for Ductile Iron Castings.
19. A563 - Specification for Carbon and Alloy-Steel Nuts.
20. A563M - Specification for Carbon and Alloy Steel Nuts [Metric].
21. A746 - Specification for Ductile Iron Gravity Sewer Pipe.
22. A888 - Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
23. B32 - Specification for Solder Metal.
24. B62 - Specification for Composition Bronze or Ounce Metal Castings.
25. B88 - Specification for Seamless Copper Water Tube.
26. B88M - Specification for Seamless Copper Water Tube [Metric].
27. B280 - Specifications for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
28. B306 - Specifications for Copper Drainage Tube (DWV).
29. B813 – Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Tube Alloy.
30. B828 – Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.
31. C564 - Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
32. C1277 - Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.
33. D635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.
34. D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
35. D1785 - Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
36. D2000 - Classification System for Rubber Products in Automotive Applications.
37. D2321 - Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
38. D2467 - Specification for Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
39. D2657 - Practice for Heat-Joining Polyolefin Pipe and Fittings.
40. D2665 - Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
41. D3034 - Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
42. D3222 - Specification for Unmodified Poly(vinylidene Fluoride) PVDF Molding Extrusion and Coating Materials.
43. D3311 - Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns.
44. D4101 - Specification for Propylene Plastic Injection and Extrusion Materials.
45. F402 - Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.

46. F439 - Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
47. F441 - Specification for Chlorinated Poly(Vinyl) Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
48. F493 - Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
49. F656 - Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
50. F876 - Specification for Crosslinked Polyethylene (PEX) Tubing.
51. F877 - Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems.

D. American Welding Society (AWS).
1. A5.8 - Specifications for Brazing Filler Metal.

E. American Water Works Association (AWWA)
1. C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. C110 - Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in.
3. C111 - Rubber gasket joints for ductile-Iron Gray-Iron Pressure Pipe.
4. C151 - Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand Lined Molds for Water and Other Liquids.
5. C606 - Grooved and Shouldered Joints.
6. C651 - Standard for Disinfecting Water Mains.

F. Copper Development Association (CDA)
1. Tube Handbook.

G. Factory Mutual (FM)
1. 1680 - Approved Standard for Couplings Used in Hubless Cast Iron Systems for Drain, Waste, or Vent, Sewer, Rainwater or Storm Drain Systems Above and Below Ground, Industrial/Commercial and Residential.

H. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
1. SP-43 - Wrought Stainless Steel Butt-Welding Fittings.
2. SP-73 - Brazing Joints for Wrought and Cast Copper Alloy Solder Joint Pressure Fittings.

1.3 WARRANTY

A. Refer to Section 23 05 00.

PART 2 PRODUCTS

2.1 PIPING MATERIALS - UNDERGROUND

A. Sanitary drainage systems - inside building to 1.5 meters (5 feet) outside building - 300-mm (12-inch) size and larger.
1. Service weight cast iron hub and spigot soil pipe and fittings conforming to ASTM A74 with push-on compression gaskets conforming to ASTM C564.

B. Fire Protection and Domestic Water Piping Systems.
1. Outside buildings to within 1.5 meters (5 feet) of building: Refer to Division 2.

2.2 BEDDING AND BACKFILL MATERIALS

A. Granular Material
   1. Crushed stone or pea gravel which will pass the 12.5 mm (1/2-inch) sieve but will be retained on the 4.75 mm (No. 4) sieve (U.S.A. Standard Series)

B. Sieves.
   1. ASTM E11.

C. Sand.
   1. Natural particles of granular material which does not contain excessive amounts of clay, silt, or organic material, passing a 9.5 mm (3/8-inch) sieve. Sand found on the job site may be used if it is approved by the Architect.

2.3 PIPING MATERIALS - ABOVEGROUND

A. Refrigerant

Item	Type Joint	Class or Size	Pressure Rating	Material &/ or Spec'n.	Remarks
Tubing		All		ASTM B280	Hard drawn
Fittings	Brazed	All		ASME B16.22	Wrought Copper Streamlined Pattern
Joining Material		All		AWS A5.8	Brazing filler Metal BAg-1 Silver

B. Cooling Coil Condensate drainage

Item	Type Joint	Size	Class or Pressure Rating	Material &/ or Spec'n	Remarks
Tubing		up through 150-mm (6-in.)	Type L	ASTM B88	Hard drawn Copper
Fittings	Solder	up through 50-mm (2-in.)	Type L	ASME B16.22	Wrought Copper
Couplings	Grooved	67 mm (2-1/2-in.) through 150-mm (6-in.)	1.0 MPa (150 lb.)	ASTM A536	Ductile Iron Rigi
Unions	Solder	up through 54 mm (2-in.)	1.0 MPa (150) lb.	ASTM B62	Bronze
Flanges	Grooved	67 mm (2-1/2-in.) through 150-mm (6-in.)	1.0 MPa (150 lb.)	ASTM A536	Ductile Iron
Gaskets		67 mm (2-1/2-in.)	Pressure	ASTM	Grade E

	through 150-mm (6-in.)	Responsive	D2000	EPDM
Gaskets	NPS 8 & up		ASTM D2000 CA 615 A25B44Z	EPDM Grade E Green

Bolts and nuts cadmium plated for outdoor installation.

C. Domestic cold and hot water

1. All domestic cold and hot water piping within the building shall be cross-linked polyethylene (PEX) pipe, complying with ASTM F876/F877 and NSF/ANSI 61 for potable water. Pipe shall be Type PEX-A (or PEX-B as approved), rated at 100 psi minimum at 180°F. Fittings shall be either cold-expansion (F1960) or metal crimp-style (F1807), with no insert fittings allowed behind finished walls. PEX shall be installed per manufacturer's instructions and ASTM F2164 (pressure test). Provide UV protection during storage and installation; exposed PEX above grade outside building is not permitted.

2. Insulate all cold and hot water lines per current Arizona state energy code (resilient closed-cell foam min. ½" for cold, 1" for hot). Provide copper stub-outs at fixtures and a dielectric water service connection. Mark PEX runs for future access (e.g., photos or tracer wire) per local Phoenix plan review requirements. All work subject to final pressure test (minimum 100 psi for 2 hours with <5% drop).

D. Natural Gas, Liquified Petroleum Gas (LPG) and Fuel Oil

Item	Type Joint	Size	Class or Pressure Rating	Material &/or Spec'n.	Remarks
Pipe		Up through NPS 2	Sch. 40	ASTM A53, ASME B36.10M	Seamless, CW or ERW Blk. Stl. Grade B
Pipe		NPS 2-1/2 & up	Sch. 40	ASTM A53, ASME B36.10M	Seamless, CW or ERW Blk. Stl. Grade B.
Fittings	Scrd.	Up through NPS 2	Class 150	ASME B16.3	Malleable Iron
Fittings	Weld.	NPS 2-1/2 & up	Std. Wt.	ASTM A234	Forged Steel
Unions	Scrd.	Up through NPS 2	2.0 MPa (300 lb.)	ASTM A47	Malleable Iron
Flanges		NPS 2-1/2	1.0 MPA	ASTM A181	Grade 1

	& up	(150 lb.)		
Gaskets	NPS 2-1/2 & up	3 mm thk. (1/8 inch)	Flexitallic Style CG	Ring
Thread Sealant	13 mm (1/2 inch) wide x 1.0 mm (4 mils) thick		Teflon	Ribbon
Bolts			ASTM A307 Grade B Thread ANSI B1.10/ ASME B18.2.1 Class 2B Fit	Carbon Steel Machine Bolts

Bolts and nuts cadmium plated for outdoor installation.

E. Sanitary Drain, Plumbing Vent and Storm Drain

1. Hubless, cast iron, soil pipe and cast iron fittings per ASTM A888. Provide standard couplings of 24 gage type 301 stainless steel, in conformance with ASTM C1277, and incorporating a neoprene gasket in accordance with ASTM C564, with sealing rings under each stainless steel clamp band. Provide two tightening bands on pipe up to 100 mm (4-inch) and four bands on piping 125 mm (5-inch) through 250 mm (10-inch).

PART 3 EXECUTION

3.1 UNDERGROUND PIPING INSTALLATION

A. Trench Excavation.

1. Excavate trenches so that piping may be laid correctly on line and grade. Remove any large rocks or other debris encountered in the excavation and dispose of appropriately.
2. Excavate to a sufficient depth and width to provide adequate room for construction and installation of the work except that the width of the trench from the pipe invert to a point 300 mm (twelve inches) above the top of the pipe shall not be greater than 760 mm (30 inches).
3. Where it is impossible to maintain proper line and grade, excavate below grade and replace the bedding with compacted sand.

B. Excavation for Structures.

1. Make excavation for structures such as manholes, sumps, interceptors and basins, to the depth required for pouring or placing the base slab. Whenever possible, rest the base on the natural surface of the excavation with a minimum amount of compacted sand-cement mixture to be used for leveling. In no case will more than 75 mm (three inches) of sand-cement mixture be permitted under a base slab and if ground conditions or excess excavation causes need for more than 75 mm (three inches) of fill or leveling course; provide sand fill, compacted in place.
2. Excavate for a structure only wide enough to allow proper mortaring or pointing of joints or wide enough for forms which may be necessary.

C. Sheeting, Bracing, and Shoring.

1. Provide and maintain sheeting, bracing and shoring required to provide substantial support for the sides of excavations and trenches to prevent movement of the soil or edges of the trench, to protect the construction work and insure the safety of the workmen.
2. As the trench is backfilled, remove supports in such a manner as to prevent the caving in of the sides of the trench or damage to the pipe or structures.

D. Underpinning.
1. Where excavation work is required under or adjacent to existing footings, underpin as required to adequately support existing construction in such a manner as to avoid raising or lowering or otherwise damaging existing construction.

E. Removal of Water.
1. Keep excavations as dry as possible until backfill has been completed above the pipe. In ground containing excessive amount of water, provide and maintain such pumps and associated pipes and connections as are necessary to remove the water from the trench and assure safe, proper construction of the piping system.

F. Bedding.
1. Provide Class "B" bedding for piping inside the building, consisting of a layer of granular material with a minimum thickness of 100 mm (four inches) and a maximum thickness of 150 mm (six inches) below the bottom of the pipe barrel. Extend the bedding to a minimum depth of 300 mm (12 inches) over the top of the pipe.
2. Place sand-gravel cover in 150-mm (six-inch) layers, mechanically compacted to 95 percent of maximum density as determined by ASTM D1557.
3. Firmly support a given segment of the bottom of the pipe. The segment, as a minimum, shall be equal to five-tenths of the outside diameter of the barrel, and shall be uniformly supported by direct contact with firm bedding. Excavate bell holes at proper intervals so that no part of the load on the pipe is supported by the bells.

G. Pipe Laying.
1. Lay piping only in filled or disturbed earth after it has been compacted to properly support general construction.
2. Lay pipe in dry and clean trenches.
3. Inspect pipe and fittings for defects prior to being lowered into the trench and clean both inside of the bell and outside of the spigot.
4. Lay pipe lines straight and in true alignment with the grade and location established.
5. Install cast iron storm, sub-surface drain collector and sanitary drainage systems in accordance with manufacturer's recommendations.

H. Backfilling.
1. Place and compact backfill so that subsequent harmful settlement will not occur and the installation of concrete floor slabs may proceed after completion. Begin backfilling as required at the bedding of the pipe and continue vertically to the surface.
2. Do not commence backfilling prior to inspection of the pipe. After inspection, place the sand required above the pipe and proceed with the backfilling operation.
3. Provide sand backfill mechanically compacted in 150-mm (six-inch) lifts to 95 percent of maximum density as determined by ASTM D1557, for all piping inside the building.

I. Pipes Through Grade Beams.

1. Provide pipes and tubing passing through or under building grade beams with a schedule 40 pipe sleeve with 100-mm (4-inch) clearance to prevent possible damage from building settlement.

3.2 ABOVEGROUND PIPING INSTALLATION

A. General.

1. Install pipe and pipe fittings in accordance with recognized industry practices to achieve permanently leakproof systems, capable of performing the indicated service without failure.
2. Install each piping run with a minimum number of joints and couplings but with adequate and accessible unions/flanges for disassembly and maintenance/replacement of valves and equipment.
3. Install piping with sufficient clearance from other piping, building structure and other systems to allow for the piping insulation to be properly applied.
4. Run piping above ground parallel with the lines of the building unless otherwise shown or noted.
5. Keep horizontal runs of piping as high as possible to provide maximum head room.
6. Install piping in equipment rooms so as not to interfere with aisleways and to allow unhindered egress from any point in the space.
7. Keep vertical lines straight in the partitions or furring or as close to the columns as possible.
8. Run pipe to avoid interference with ducts, wires or apparatus and with approved offsets around columns, beams and other obstructions.
9. Install piping that penetrates a vapor retarder to respect the vapor retarder integrity by sealing the opening around the pipe with vapor retardant tape.
10. Install piping with sufficient clearance from building structural members so as not to interfere with the application of steel fireproofing.
11. Establish piping elevations prior to installation to avoid interferences with other piping and materials and equipment of other trades.
12. Cutting, burning, or welding of structural steel will not be permitted.

B. Pitching of Piping

1. Pitch horizontal water and air lines to low points to provide for complete drainage of the system. Minimum pitch, unless otherwise shown: 20 mm in 10 meters (1 inch in 40 feet). Install drain valves at low points and air vents at high points and at locations where air may pocket on water lines.
2. Pitch gravity condensate return lines to condensate receivers. Pitch steam lines for drainage in direction of flow and provide with drips at low points. Minimum pitch, unless otherwise shown: 4 mm per meter (1/2 inch in 10 feet).

C. Separation of Piping:

1. Separate cold piping from hot piping with a minimum of 150 mm (six inches) air gap between outside diameters of the piping. If piping is insulated, locate the 150-mm (six-inch) air gap between outside diameters of the insulation

D. Drains.

1. Pipe drains from items such as boilers, water relief valves, tanks, cooling coil drain pans, air vents, environmental rooms evaporator condensate drain pans, and drip-pan elbows, to the nearest floor drain.

E. Copper Tubing.

1. Swaging copper tubing to couple two lengths together instead of using an approved solder type coupling will not be permitted. Incompletely filled solder joints are not acceptable.
2. Make up horizontal joints on piping NPS 2-1/2 and larger in the vertical position before assembly and erection.
3. Clean surfaces to be soldered both the inside of the fitting and the outside of the tubing, with steel wool or fine sandpaper until all discoloration is removed and metal is smooth and bright.
4. In assembling copper tube systems, take care to establish proper grade and alignment in the system before soldering. Installations will not be approved where tube and fittings are subjected to strain in order to obtain grade or alignment.
5. Do not bend copper drainage or vent tubes.
6. File or ream cut tube ends to the full original bore.
7. Nipples or sections of heavier wall tube in a DWV (drain, waste, vent) are not permitted.
8. Provide a dirt leg at the bottom of all natural gas piping drops.
9. Do not install type DWV (drain, waste, vent) tube lower than 150 mm (6 inches) above ground.
10. The inter-membering of copper and brass with ferrous metal is not permitted.
11. Make the transition between ferrous and nonferrous metal at an exposed and readily accessible location in a water service or at a water heater. Use insulating couplings at these points. (See Paragraph Insulating Couplings.)
12. When copper drainage tube is caulked into a hub, first solder to the tube an approved type cast brass adapter or ferrule, long enough to extend through the lead. No lead caulked joint is permitted where the lead is caulked directly against the copper tube.
13. Do not use soft annealed copper tube as drainage or vent piping.

3.3 PIPE JOINTING

A. Mechanical Joint Cast Iron Pipe.
1. Assemble mechanical joint cast iron pipe with a gasket suitable for the service, according to the manufacturer's recommendations.

B. Cast Iron Hub and Spigot Pipe.
1. Spigot ends shall be less beads and pre-marked to assure proper joint connection by visual inspection. Bells shall be modified to receive rubber gaskets conforming to ASTM C564 gaskets for Type II pipe.

C. Cast Iron Hubless Pipe
1. Make joints by using a neoprene gasket and stainless steel sleeve using a torque wrench pre-set at 6.8 newton meters (60 inch pounds) on standard couplings and 9.1 newton meters (80 inch pounds) on heavy duty couplings to ensure consistently made joints.

D. Steel Pipe
1. Provide steel pipe NPS 2 and smaller with threaded ends and screwed joints. Provide sizes NPS 2-1/2 and over flanged or grooved with gaskets or welded. Welding of galvanized pipe is not permitted. Connect galvanized pipe with screwed fittings, companion flanges or approved mechanical couplings.
2. Ream pipe ends and take care to prevent foreign material from entering any pipe.
3. Make screwed joints with oil and graphite or other approved compound. Apply joint compound to male thread only and take care to prevent compound from reaching interior of pipe.

4. Install unions and companion flanges in the pipe lines at locations as required to permit the removal of fixtures, apparatus and equipment without dismantling. Do not install unions and companion flanges in walls, partitions or other inaccessible locations.

E. Stainless Steel Tubing
1. Install piping to be completely drainable, pitching 16 mm in 10 meters (1 inch in 50 feet) to drain points and installing only eccentric type reducers.
2. For tubing sizes up through 25.4 mm (1-inch), instead of fittings, tubing may be bent, using a tubing bender in accordance with ANSI B11.15 and ASME B31.1.
3. Install diaphragm valves and automatic flow controls oriented to permit drainage per manufacturer's instructions.
4. Equip low points of piping with system drain valves. For tubing sizes 12.7 mm (1/2-inch) through 50.8 mm (2-inch), install 13-mm (1/2-inch) valves. For sizes 76.2 mm (3-inch) and 101.6 mm (4-inch), install 25-mm (1-inch) valves.
5. Make welds with Tungsten Inert Gas (TIG) automatic welding machine, without filler metal, using direct current, straight polarity welding technique.
6. Obtain Owner's prior permission for any welds that cannot be made by the welding machine. Use 316L filler metal for Owner-approved manual welds.
7. Butt weld joints with internal and external argon or helium purge gas, 100 percent penetration with good fusion.
8. Remove butt weld connection from ball valves before welding in place.
9. Perform all welding in compliance with ASME B31.1.

F. Copper Pipe
1. Solder joint connections.
   a. Use ASTM B813, water flushable, lead-free flux; ASTM B32, lead-free solder; and ASTM B828 procedure, unless otherwise indicated.
   b. Use a multiple-flame circular torch for soldering tubing 62.5 mm (2 1/2 inches) and larger.

G. “T-Drill” Tube Branching System
1. Copper tee fittings may be made by means of the “T-Drill” tube branching system, providing:
   a. The size and wall thickness of both the run tube and the branch tube are listed by the manufacturer of forming equipment as “Acceptable Application”.
   b. The mechanically extracted collars are formed by means of a continuous operation consisting of drilling a hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the branch tube wall so as to comply with the American Welding Society lap joint weld. Employ a collaring device that is completely adjustable to ensure proper tolerance and complete uniformity of the joint.
   c. The end of branch tube is notched to conform to the inner curve of the run tube, and dimpled to set the exact penetration depth into the collar.
2. Braze all joints in accordance with the CDA Tube Handbook, using BcuP series filler metal. Soft soldered collar joints are not permitted.

H. “T-Drill” Tube Coupling System
1. Copper couplings may be made by means of mechanically formed couplings, providing:
   a. The couplings are formed by first annealing the area at the end of the tube where the expansion is to occur, inserting the tube expander to the die size required and expanding the tube to accept tubing of the same size.

b. The resulting joint is a minimum of three times as long as the thickness of the tube and is brazed using B-CuP series filler metal.

I. Metallic Pipe Threads
1. Provide screwed pipe and fitting threads that comply with ASME B1.20.1. Discard pipe with threads that are stripped, chipped, corroded or otherwise damaged.
2. Do not use any pipe on which a weld has opened up during the operation of cutting or threading.
3. Field thread metallic pipe in accordance with the following table:

Iron Pipe Size NPS	Approx. Length of Threaded Portion mm	(in.)	Approx. No. of Threads to be Cut
½	18.75	¾	10
¾	18.75	¾	10
1	21.88	7/8	10
1-1/4	25	1	11
1-1/2	25	1	11
2	25	1	11

4. Use only those thread compounds that are compatible with the liquid or gas being carried in the pipe and that are resistant to the action of the liquid or gas or to any other chemical constituents of the carried liquid or gas.

J. Pipe Welding
1. Perform steel pipe welding by either oxy-acetylene or electric arc method and perform by approved welders qualified in accordance with the "Welder Qualifications and Procedures" in Section 15010. Use welding procedures and provide joint quality which strictly conforms to above procedures. The Architect reserves the right to require qualifying demonstrations, at the Contractor's expense, of any welders assigned to the job.
2. Make tee connections in welded piping with a factory fabricated butt welding tee or with weld-o-let of butt, socket or threaded type. When weld-o-lets are used provide a branch connection which is one-half the diameter of the main or less. Scarf welding or direct butt welding of side connections will not be permitted. Tees fabricated from pipe will not be permitted.
3. Use long radius welding ells wherever possible, in changing pipe directions of welded pipe lines. Mitered joints are not acceptable.

K. Pipe Welding Substitute
1. As an alternative to the welding of carbon and stainless steel, the following joining system is acceptable:
2. Perform the joining of carbon and stainless steel pipe by means of the “Elastic Strain Preload” system as developed by LOKRING. Provide a system, when employing the manufacturer’s pressurizing tool and special fittings, produces contact stresses sufficiently high to plastically yield the pipe surface under the fitting sealing lands forming a circumferential metal-to-metal seal between the pipe and the fitting body.
3. Carbon Steel: Lockring Series MAS-3000 carbon steel pipe fittings for sizes NPS ¼ through NPS 3 in pipe schedules 40 and 80 meeting the pressure and fatigue requirements of ASME B31.1 and B31.3 and operating temperatures of from –28.9 to 343.3 degrees C (-20 to 650 degrees F).
4. Stainless Steel: Lockring Series SS-40 Type 316L stainless steel pipe fittings for sizes NPS ½ through NPS 2 in pipe schedules 40 and 80 meeting the pressure

and fatigue requirements of ASME B31.1 and B31.3 and operating temperatures of from –51.1 to 426.6 degrees C(-60 to 800 degrees F).

L. Grooved Pipe and Fittings
1. Tighten all nuts to assure firm metal contact of the coupling pads.
2. Before assembly of couplings, lightly coat pipe ends and outside of gasket with cup grease or graphite paste to facilitate installation.
3. Independently support branch piping to eliminate stress on coupled joint.
4. For spacing and location of the pipe hangers for the grooved piping, follow the requirements of paragraph "Hangers and Supports" in Section 15060.

M. Insulating Couplings
1. Insulate connections between dissimilar metals, copper to steel, by providing an insulating coupling or a dielectric flanged connection.
2. Watts 3000 Series or equal product of Epco Sales, Inc. or Hart Industries, Inc.

N. Misalignment Couplings
1. Provide misalignment couplings in the suction and discharge piping of end and double suction pumps. Misalignment couplings shall be "dresser" couplings consisting of a four-diameter length of pipe between connections.

O. Flanges
1. Provide flanges with 1.6-mm (1/16-inch) raised and drilled face, of the weld-neck type. Slip-on type flanges will not be allowed.
2. Where flanges with raised faces are joined to companion flanges with a flat face, machine the raised face down to a smooth matching surface and use full face gasket.
3. Provide gaskets suitable for the liquid or gas service intended. Gaskets containing asbestos material will not be permitted.

P. Reducing Fittings
1. For proper drainage and air elimination, provide eccentric type fittings when decrease in pipe size is necessary. Bushings will not be permitted.
2. For water and other liquid lines, install the top of pipe on a continuous straight line.
3. For steam, gas, gravity condensate, and air lines, install the bottom of the pipe on a continuous straight line.

END OF SECTION

SECTION 23 05 00

COMMON RESULTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes.

1. This Section includes the basic requirements peculiar to Divisions 22 and 23 and common to more than one Section of Divisions 22 and 23. This Section supplements the General Requirements in Division 1.

2. Installation of any wiring provided under Section 23 05 01 shall comply with requirements of Division 26.

1.2 Codes

A. The project shall comply with the latest edition of the following codes:

1. Arizona State Fire Code, latest edition.
2. Uniform Building Code, latest edition.
3. Life Safety Code, NFPA 101, latest edition
4. National Electrical Code, latest edition
5. OSHA 1910, latest edition: 29 CFR 1910 and 1926
6. International Mechanical Code, latest edition
7. International Plumbing Code 2018 Edition, latest edition
8. NFPA
9. Americans with Disabilities Act
10. IAQ Guidelines for occupied buildings under construction as published by SMACNA.
11. ANSI/AIHA Z9.5 Laboratory Ventilation.

1.3 REFERENCES:

A. The project shall comply with the latest edition of the following references:

B. American Society of Mechanical Engineers (ASME).

1. B31.1 - Power Piping.
2. Boiler and Pressure Vessel Code.
   a. Section I - Power Boilers.
   b. Section IX - Welding and Brazing Qualifications.

C. American Society for Non-Destructive Testing, Inc. (ASNT)

1. SNT-TC-1A - Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing.

D. American Welding Society (AWS)

1. D1.1 - Structural Welding Code – Steel.
2. QC1 - Specifications for Qualification and Certification of Welding Inspectors.

E. National Fire Protection Association (NFPA)

1. 70 - National Electric Code.

1.4 REFERENCE TO DESIGN DRAWING SCHEDULES

A. Maximum and Minimum Requirements.

1. Refer to equipment schedules for equipment identification number and corresponding area location, capacity, and design requirements.
2. Wherever schedules or notes appear in the Contract Documents in which sizes and capacities of equipment are indicated or specified, provide equipment under the Contract which meets the following requirements under operating conditions:
   a. The rpm, the outlet velocities, tip speeds and the NC ratings specified are the maximum that will be accepted.
   b. The m^3/s (cfm), the static pressure on fans, the m^3/s gpm and the total head on pumps, are the minimum that will be accepted.
3. Motor horsepower ratings specified or shown: the minimum acceptable; indicated motor speeds: the maximum acceptable. If a motor is provided having a larger horsepower rating than specified, provide the associated increased wire, breaker, starter, fuses, overload protection, etc. Provide the increased motor circuit in accordance with the "Motor Circuit Sizing Schedule" indicated. Do not provide increased motor horsepower which together add more than 5 percent to the load of an electrical distribution equipment item (i.e., Motor Control Center, Power Panel, etc.).

1.5 SUBMITTALS

A. Shop Drawings, Product Data and Samples

1. Submit Shop Drawings, Product Data and Samples for the materials, equipment and systems (products) so specified elsewhere in Divisions 22 and 23.
2. Refer to Section 01300 for general requirements.
3. Refer to Section 01630 for product options and substitutions.
4. On Shop Drawings, indicate that the Contractor has coordinated piping and ductwork systems with the building and electrical work, equipment and components of equipment furnished by the Contractor, Owner's equipment and equipment of other trades to eliminate interference and conflicts between various portions of the Work.
5. Submit prints of reflected ceiling plans with proposed access door sizes and locations indicated.
6. Compliance Statement
   a. Submit a document which states where any proposed product deviates from the specification requirements. This includes all Part 1, Part 2, and Part 3 specification items. Specification requirements not noted as deviations will be assumed as complying.
   b. Provide the statement in an itemized, columnar format as follows:
      Column 1 - Reference to the specification item, organized in the same sequential order as in the specification.
      Column 2 - Explanation for noted deviations

B. Equipment Performance Curves

1. Fans.
   a. Submit performance curves on each fan for approval, indicating fan pressure volume and horsepower curves. The fan volume selection points: a minimum of fifteen percent greater than the volume at the peak of the pressure volume curve. No point on the pressure-capacity curves shall exceed the motor horsepower selected to drive the fan. Maximum motor horsepower at the selection point: 95 percent of the rated motor horsepower. On the performance curves, include the effects of all accessory items, such as inlet vanes or scroll dampers. Since some fans may be scheduled for future higher duty, select fans that meet both the flow and pressure scheduled on the Drawings.

C. Operation and Maintenance Manuals

1. Submit operation and maintenance manuals for each mechanical system, except as otherwise specified herein, and for each piece of equipment. Manuals for the system as a whole will not be required for outside water distribution systems or sewer systems.
2. Furnish three copies of the manual bound in hardback binders or an approved equivalent. Furnish one complete manual prior to the time that system or equipment tests are performed, and furnish the remaining manuals before the Contract is completed. Inscribe the following identification on the cover: the words "Operating and Maintenance Manual", the name and location of the building and the name of the Contractor.
3. Include the names, addresses, and telephone numbers of each subcontractor installing equipment and systems and of the local representatives for each item of equipment and each system. Provide a table of contents, assemble the manual to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instruction sheets shall be legible and easy to read, with large sheets of drawings folded in.
4. Include the following in the manual:
    a. A system layout showing piping, valves, and controls.
    b. Wiring and control diagrams with data to explain detailed operation and control of each component.
    c. A control sequence describing start-up, operation and shut-down.
    d. A detailed description of the function of each principal component of the system.
    e. The procedure for starting.
    f. The procedure for operation.
    g. Shut-down instructions.
    h. Installation instructions.
    i. Maintenance and overhaul instructions.
    j. Lubrication schedule including type, grade, temperature range, and frequency.
    k. List of size, location and number of filters.
    l. Safety precautions, diagrams, and illustrations.
    m. List of size and location of V-belts.
    n. Test procedures.
    o. Performance data.
    p. Parts lists
5. In the parts lists for equipment, indicate the sources of supply, recommended spare parts, and the service organization which is reasonably convenient to the building site.
6. Provide the manual complete in all respects for all equipment, controls, accessories, and associated appurtenances provided

D. Posted Operating Instructions

1. Furnish operating instructions for each system and each principal piece of equipment for the use of operation and maintenance personnel, including wiring and control diagrams showing the complete layout of the entire system including equipment, piping, valves, and control sequence, framed in laminated plastic and posted where directed.
2. Provide printed or engraved operating instructions for each principal piece of equipment, attached or posted adjacent to the piece of equipment, including start-up, proper adjustment, operating, lubrication, shut-down safety precautions, procedure in the event of equipment failure and any other necessary items of instruction as recommended by the manufacturer of the unit.
3. For operating instructions exposed to the weather, use weather-resisting materials or enclose suitably so as to be weather protected. Provide operating

instructions which do not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

E. Record Drawings
1. Provide a set of white prints and clearly mark, as the job progresses, all changes and deviations from that shown on Contract Drawings.
2. Drawings shall be kept up-to-date during construction and in addition to field measurements shall include change orders, field instructions and all other changes.
3. On completion of the building, the Mechanical Contractor shall forward to the Architect the set of marked-up drawings indicating all such changes and deviations for review by the Architect. After the drawings have been reviewed, provide a set of reproducible mylars to the U of A, transferring all of the construction information from the construction drawings using Auto Cad drafting techniques.

1.2 QUALITY ASSURANCE

A. New Products
1. Provide all piping, valves, ductwork, equipment and miscellaneous accessories and appurtenances which are new. Do not permit previously used material of any kind to be incorporated into any of the building systems.

B. Equipment Design
1. Design equipment and accessories not specifically described or identified by manufacturer's catalog numbers in conformity with applicable technical standards and suitable for maximum working pressure, test pressure and temperatures required.

C. Equipment Installation
1. Obtain manufacturer's printed installation instructions to aid in properly executing work of installing equipment whenever such instructions are available.
2. Erect equipment in a neat and workmanlike manner. Align, level and adjust for satisfactory operation. Install so that connecting and disconnecting of piping and accessories can be made readily, and so that parts are easily accessible for inspection, operation, maintenance and repair. Minor deviation from arrangements indicated may be made, as approved.

D. Packaged Equipment
1. Provide packaged equipment, where specified, which is completely factory assembled, including all mechanical and electrical components mounted on a common base or in a common enclosure with all piping, controls and wiring factory installed ready to be incorporated into the mechanical system.

E. Quietness of Operation
1. Pumps, fans, motors and other equipment with moving parts have been especially selected for quietness of operation.
2. For equipment other than that specified, submitted by the Contractor for approval, submit written statements from the manufacturer and the Contractor that said equipment is at least as quiet as that specified and include certified sound test data to support the claims made.

F. Balancing of Rotating Equipment
1. Wherever static and dynamic balancing of equipment is specified, maximum vibrational velocities measured at the fan or pump shaft or other rotating shaft bearing caps: 2.5 mm (0.1 inch) per second peak in any plane.

1.3 WARRANTIES

A. General
1. Refer to the Conditions of the Contract for provisions concerning Contract general warranty, correction of Work period and for form of special warranty.
2. Submit special warranties for the products so specified elsewhere in Divisions 22 and 23.

B. Service During Contract Correction Period
1. In the event of the failure of any system or its component equipment items or the improper functioning thereof, within the period provided in The Conditions of the Contract for correction of the Work, or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required elsewhere in Divisions 22 and 23, have available and "on call" within eight hours or less, competent service personnel for the restoration of systems and equipment for complete operation.
2. Should the nature of the failure be such as to present an emergency, in the opinion of the Owner, make such personnel promptly available, regardless of the hour of the day or the day of the week.
3. Should the failure be such as to fall under this warranty, pay the cost of the services; otherwise the Owner will pay for such service at the prevailing rate.
4. Should the Contractor fail to make such service personnel available "on call" within eight hours or less, the Owner may employ such personnel as are available to the Owner, at the expense of the Contractor.

PART 2 PRODUCTS

2.1 ACCESS DOORS

A. Manufacturers
1. Access doors in walls and ceilings: 600 x 600-mm (24 x 24-inch) size, unless otherwise indicated, as manufactured by Milcor Limited Partnership; Karp Associates, Inc.; Nystrom, Inc.; or as approved.

B. Fabrication
1. Frames and panels: prime painted steel, minimum thickness in USS gage as follows:
   a. Frames - 16 gage.
   b. Panels for non-labeled doors - 14 gage.
   c. Panels for labeled doors - 20 gage face sheets, flush design with filler.
2. For frames for installation in masonry walls and gypsum wallboard construction, provide exposed flange to lap wall construction 13 mm (1/2 inch) minimum. For frames in masonry walls, provide masonry anchors welded on.
3. For frames for installation in plastered surfaces, provide 22 gage expansion casing bead attached.
4. For frames for flush installation in gypsum wallboard construction provide galvanized drywall bead.

C. Hardware
1. For non-labeled doors, provide concealed spring type hinges opening to 175 degrees and flush, screwdriver-operated metal cam locks.
2. For labeled doors, provide continuous hinges with stainless steel pins and flush, self-latching cylinder locks with 2 keys per lock. Maximum size for labeled doors is 800 x 800 mm (32 x 32 inches).

3. Masterkey cylinder locks to building system.

D. UL Labels
1. For labeled access doors, provide a UL classification marking reading "Frame and Fire Door Assembly, Rating 1-1/2 hr. (B), Temperature Rise 30 Minutes, 121 Degrees C (250 Degrees F) Maximum".

PART 3 EXECUTION

3.1 ERECTION, INSTALLATION, APPLICATION

A. Dimensions and Design:
1. Provide apparatus and equipment of such dimensions and design as to be adapted to the arrangement of the installation and to fit within the limits of the space available.

B. Stand-Off Brackets.
1. Provide insulated equipment, piping and duct work with stand-off brackets for attaching components to allow full insulation thickness.

C. Special Tools.
1. Provide tools required to operate, adjust, or make minor repairs to the equipment and install them in a wall mounted wood or metal case. Provide the case with a lock and two keys.

D. Standard Products.
1. Provide products and equipment that are essentially the standard product of the manufacturer. Where two or more units of the same product or type of equipment are required, provide these units as products of the same manufacturer.
2. Where the requirements of the Contract Documents exceed that of a manufacturer's standard product in terms of quality, performance or efficiency, the manufacturer shall make special provisions to ensure that the product proposed meets the requirements of the Contract Documents.

E. Interferences.
1. Refer to Section 01310 for submittal requirements.
2. Before proceeding with the installation of piping and ductwork, inspect the Contract Documents and determine that the location of the Work does not interfere with other work. In case of interference request clarification from the Architect in writing.

F. Drains.
1. Pipe drains from items such as autoclaves, water relief valves, tanks, cooling coil drain pans, and drip-pan elbows, to the nearest floor drain.

G. Piping Clearance Over Electrical Equipment.
1. Do not run piping over electrical equipment such as transformers, switchgear and panelboards. Extend the clear space above this equipment to the structural ceiling above. Dropped, suspended and similar ceilings not intended to add strength to the building structure are not be considered structural ceilings.

H. Clearance in Front of Electrical Equipment.
1. Do not run piping or ductwork within the three foot clear space in front of electrical equipment panels, starters etc. as required by NFPA 70.

2. Install packaged mechanical equipment that has factory mounted electrical panels or starters in compliance with the clear space required by NFPA 70.

I. Offsets and Transitions
1. In general, most main offsets and transitions of piping and duct work are shown on the drawings in order to indicate approximate locations in plan and elevation where the systems are intended to be run.
2. The Contract Documents are not intended to serve as coordinated construction drawings showing all minor adjustments in locations and duct cross sections that are required for a fully coordinated installation that respects the work of all trades.
3. Fully coordinate the mechanical work within itself and with the work of other trades to ensure the avoidance of all interferences.

J. Provision for Future Expansion and/or Installations
1. Where piping, ductwork and equipment is indicated for use in future expansion of the building and/or for future installations within the building, the Contractor shall leave sufficient clear space and install the piping, ductwork and equipment in such manner that connections to the future building expansion and/or future installations within the building can be made without removing existing floors, walls, ceilings. The Contractor shall consult with the Architect/U of A whenever necessary for this purpose.
2. Any piping stub-outs provided for future connections to domestic hot and cold water piping systems shall be arranged so that “dead legs” (i.e., pipe sections where there is no water circulation) are prevented. The termination point of any piping stub-out shall be as close to the main piping flow as physically possible. Where future branch lines must extend a distance greater than ten (10) branch line pipe diameters from the main piping flow, a valved drain port or blind flange with a valved drain shall be provided at the end of the branch piping to allow periodic flushing.
3. Abandonment of Domestic Water Piping.
    a. Verify routing of existing domestic hot and cold water piping systems prior to their being abandoned. Cap abandoned branch lines as close as physically possible to the main piping flow to eliminate “dead legs”. Elimination of “dead legs” shall not hinder the proper operation of any existing hot water return, i.e., recirculation, systems.

K. Lines and Grades
1. Construct Work in conformity with lines and grades as indicated.
2. Lay out the Work and be responsible for lines, elevations and measurements required for the installation of the Work.
3. Space axis lines within building on each floor level so that mechanical work may be laid out with metal tape measure having length of 100 feet maximum. The use of cloth tape for lay-out will not be permitted.
4. Use bench marks outside building from which lines and grades required for installation of mechanical work may be set.

L. Identification
1. For piping ductwork, and equipment identification, refer to Section 22 05 05.
2. Nameplates
    a. For each component of equipment, provide the manufacturer's name, catalog number and date of manufacture on a plate securely attached to the item of equipment, or the name and catalog number and date of manufacture may be stamped or cast into the body of the item. Also include data pertinent to the operation and characteristics of the equipment.

M. Charts and Diagrams
1. Provide, as part of “Operation and Maintenance Manual”, the following diagrams and charts:
a. Diagrammatic layout of piping systems, showing equipment and giving location of each valve and trap.
b. Diagrammatic layout of each fan duct system, giving location of each damper.
c. Diagrammatic layout of automatic temperature control systems, giving location of each instrument, damper and piece of equipment controlled

N. Painting
1. Painting is specified in Section 09900.

O. Access Doors
1. Provide access doors in walls or ceilings to enable access to concealed mechanical devices that require service unless such devices are installed in exposed location or above lay-in ceilings.
2. These devices include, but are not limited to the following: Valves, strainers, pressure gauges, thermometers, expansion joints, clean-outs, trap-primers, coils, pumps, humidifiers, fans, filters, flexible duct, dampers air terminal units and control devices.
3. Build access doors into walls of pipe spaces, spaces above controlled environment rooms, and other locations indicated.
4. Provide labeled access doors for access through rated separations to mechanical devices.
5. Install access doors true and plumb with building construction.
6. Coordinate the exact location with the work of other trades in order to provide a neat appearance.
7. Verify the exact quantity, size and location of the required access panels and doors after the systems and equipment requiring access have been installed and prior to the closure of the affected ceilings and building assemblies.

3.2 TEMPORARY USE OF EQUIPMENT

A. Permission must be obtained from Architect/U of A prior to operating any mechanical systems during construction.

B. Where the mechanical systems are operated during construction, the Mechanical Contractor shall maintain the system and equipment in proper operating condition.

C. Before any area of the building is turned over to the U of A for acceptance and for beginning of the guarantee/warranty period, the systems and equipment shall be returned to the initial new condition, e.g., by replacing used air filters with new air filters, cleaning the air side of all coils in the new fan coil units, lubricating all bearings according to manufacturer’s factory standards and adjusting control systems according to specifications and/or to suit the U of A.

3.3 ACTIVATION OF HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

A. Activation of the permanent heating, ventilating, and air conditioning systems for testing and balancing will be allowed only after the building is substantially complete, or by written request to and written permission of the Architect.

B. Thoroughly flush and clean all supply and return piping, strainers etc., before the heating and air conditioning systems are activated. Clean all strainers at least once each week

for the first month of system operation and then once each month thereafter until Owner's final acceptance of the work. Re-check systems for compliance with the Contract Documents to establish that they are free of all defects resulting from early activation of the permanent heating, ventilating and air conditioning systems. Before final acceptance of the work by the Owner, again flush, clean and adjust the systems and replace all strainer baskets.

C. Install a set of the specified primary filters at fan coil units as temporary filters to prevent the accumulation of dust and dirt in all the duct systems before the heating, ventilating and air conditioning duct systems are activated. If the temporary filters become loaded to capacity during system activation, replace the filters. Install replacement filters upon completion of the Work and prior to acceptance of the Work by the Owner.

D. Thoroughly clean all ductwork after early activation of the permanent heating, ventilating and air conditioning systems and before being turned over to the Owner. Clean either by vacuum cleaning or blowing out with a pressure blower.

E. Properly operate, and maintain the permanent heating, ventilating and air conditioning systems to the time of final acceptance by the Owner. Make any adjustments and repairs required to comply with the Specifications, tests, and balancing of the permanent systems to the satisfaction of the Architect before final acceptance of the system by the Owner and Architect. Make all repairs and adjustments required to put the heating, ventilating and air conditioning systems and equipment into first class condition before final acceptance by the Architect and Owner.

3.4 PROTECTION

A. Piping Systems
   1. Before starting up piping systems, provide temporary 20 mesh screens in each strainer. Remove temporary screens and replace them with permanent screens only after dirt and scale has been removed from the piping system.
   2. Do not leave piping open. At the end of each work day cap over ends of piping wherever they occur until such time as piping extensions or final connections are made to equipment, fixtures, etc.

B. Air Handling Systems
   1. Continuously maintain adequate protection to keep dirt and foreign matter from getting into the air handling system.
   2. Do not leave ductwork open. At the end of each work day seal open sections of duct and open fittings wherever they occur until such time as duct extensions or final connections are made to equipment, terminal units, grilles, registers and diffusers.

3.5 FIELD QUALITY CONTROL

A. Lubrication
   1. Rotating equipment
      a. Lubricate rotating equipment in accordance with the manufacturer's directions before it is operated. Re-lubricate rotating equipment as required during construction and upon turning over to Owner.
   2. Lubrication fittings
      a. Mount grease and oil fittings directly on bearings except when bearings are not readily accessible. Provide readily accessible and secured copper or approved flexible tubing extensions to bearing lubrication fittings when equipment bearings are not visible or are inaccessible.

B. Welder Qualifications and Procedures
   1. Welding to be done by Arizona State Certified welders only. Welders must have proof of certification in their possession.
   2. Weld inspection: Radiography (x-ray) will be at U of A's discretion.
   3. Specifications for the fabrication and erection of piping systems.
      a. Piping: ANSI B31.1.
      b. Boiler external piping: Section I of the ASME Boiler And Pressure Vessel Code.
      c. Before any welding is performed, submit a copy of the standard welding procedure specification together with the procedure qualification record as required by Section IX of the ASME Boiler and Pressure Vessel Code.
      d. Welders of stainless steel tubing shall be qualified in the Tungsten inert gas (TIG) method of welding.
      e. Before any welder shall perform any welding, submit a copy of the Contractor's record of welder or welding operator qualification tests as required by Section IX of the ASME Boiler and Pressure Vessel Code. Requalify welders who have been inactive with the welding process for a period of more than three months, or six months if allowed by the particular code for which their qualifications are being reviewed.
      f. The types and extent of non-destructive examinations required for pipe welds are as shown in table 136.4 of ANSI B31.1. If requirements for non-destructive examinations are to be other than that stated above, the degree of examination and basis of rejection shall be a matter of prior written agreement between the fabricator, or Contractor and the purchaser. Qualifications for non-destructive testing personnel shall be as established by the American Society for Nondestructive Testing in their recommended practice No. SNT-TC-1A.
      g. Welding inspectors shall meet requirements of AWS QC1.
      h. The manufacturer or Contractor shall be responsible for the quality of welding done by his organization and shall repair or replace any work not in accordance with these Specifications.
      i. Welding done to fabricate structures other than piping and vessels shall conform to the requirements of AWS D1.1.

3.6 FLUSHING, CLEANING AND CHLORINATION

A. General
   1. Flushing, cleaning and chlorination to be witnessed by the Owner.
   2. Provide only new pipe and equipment and maintain pipe and equipment clean and free from rust, dirt, scale, and other contaminants. Provide temporary air-tight covers at pipe openings at all equipment.

B. Flushing
   1. Before turning the systems over to the Owner, thoroughly flush piping systems of scale and dirt.
   2. Flush dead ends and other locations where debris may accumulate.
   3. Operate all valves to dislodge any debris in the valve body.
   4. Circulate water through piping at a minimum velocity of 6 feet per second while draining off water to sewer until water is "Potable water clear" and there is no sedimentation after an hour in a quiet standing sample.
   5. Flush steam piping with steam, blowing to atmosphere.

C. Chlorination
   1. Refer to Section 22 05 04 for chlorination of Domestic Water Systems.

END OF SECTION

SECTION 23 05 01

COMMON MOTOR REQUIREMENTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes.

1. This Section includes those electrical products pertaining to the Mechanical trades work that are:

a. Furnished, installed and wired under Divisions 22 and 23:

(1) All low voltage control devices and their related wiring. Low voltage is defined as any voltage system that is lower than the standard Project 120-volt, single phase, 60 hertz system (excluding fire and security and other communications type systems).

(2) Disconnected components in package units that are so constructed that components of wiring must be disconnected for shipment and reconnected after installation.

(3) Power circuiting (24 volt) for DDC control panel, terminal unit controllers, unitary controllers and DDC devices from transformers provided under Division 26 as shown on the drawings.

(4) Thermostats

(a) 24-volt Thermostats for Mechanical Equipment or Systems.

(5) Control devices

(a) Control relays and interlocks required between fans, pumps and other mechanical equipment. Control Transformers unless otherwise specified.

b. Furnished and installed under Divisions 22 and 23 and wired under Division 26:

(1) Motors

(a) Electric motors as required for the mechanical equipment, unless otherwise specified or indicated.

(2) Package units

(a) Where "package unit" equipment is specified, provide the equipment complete with starters, main disconnects and control devices. Package units are defined as units which include component mechanical and electrical equipment mounted on common bases, skids or frames or in common enclosures with internal control and power wiring factory installed and ready to accept a single electrical service connection.

(b) For package units with remote mounted control panels containing motor starters and auxiliary controls, provide mounting of the control panel and external wiring from the panel to the package unit.

1.2 REFERENCES

A. American National Standards Institute (ANSI) Z32.2 - Symbols, Graphic.

B. Institute of Electrical and Electronics Engineers, Inc. (ANSI/IEEE)

1. Standard 112B - Test Procedure for Polyphase Induction Motors and Generators.

C. National Electrical Manufacturers Association (NEMA)
1. MG 1 - Motors and Generators.
2. MG 2 - Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators.

D. National Fire Protection Association (NFPA)
1. 70 - National Electrical Code.

1.3 SUBMITTALS:

A. General.
1. Refer to Section 23 05 00.

B. Control Wiring Diagrams
1. Require builders and suppliers of equipment provided under Divisions 22 and 23 to submit elementary wiring diagrams; make, type and symbol of equipment; operating sequence and installation layout.
2. Provide a nameplate listing voltage, phase, frequency, full load current or rated kVA, control circuit voltage and wiring diagram attached to equipment provided.
3. On equipment having only one motor and one starter, consider the control wiring diagram normally furnished with the starting equipment to be satisfactory, providing the diagram shows all of the electrical equipment.
4. When more than one starter or auxiliary device is used (if the starters or auxiliary devices are not entirely independent), include an elementary diagram in addition to the controller wiring diagram, when requested by the purchaser or deemed necessary by the equipment builder. Show a description of the sequence of operation when it is related to the electrical equipment.
5. Employ symbols in wiring diagrams according to the ANSI Z32.3 graphical symbols for power and control.

C. Motor Protection Data
1. To enable close coordination with branch and feeder overcurrent protective devices, on motors over 100 hp submit time-current data for the motor protection scheme, include, as a minimum, locked-rotor trip current and time delay, and motor running overload trip current(s) and time delay(s).

D. Foundation and Setting Drawings
1. On equipment requiring a special foundation, show the size, purpose and location of conduit and incoming lines that must be installed under electrical work on the foundation plan furnished by the equipment supplier.
2. Furnish these drawings before the slab is poured.

E. Data Required
1. Provide complete data on mechanical Shop Drawings for all electrical equipment provided under Divisions 22 and 23.

F. Manufacturer's Field Reports
1. Submit a copy of all tests and checks of adjustable frequency motor control performed in the field, complete with meter readings and recordings, where applicable.

1.4 QUALITY ASSURANCE:

A. Hazardous Areas.

1. Provide wiring, conduit, starters, push buttons, control devices and other electrical devices furnished for any areas which are indicated as hazardous or in areas classified as hazardous by the National Electrical Code, the American Insurance Association, FM, or the NFPA, which meet all requirements for these classifications.

PART 2 PRODUCTS

2.1 MOTORS:

A. General Specifications:
1. Speed classification: as indicated or required for the service and in accordance with the established NEMA MG 1.
2. Provide motors which operate successfully at rated load with maximum voltage variation of plus-or-minus 10 percent at rated frequency.
3. Size pump and fan motors so that their design loads will not exceed 95 percent of their rated loads at 40 degrees C ambient (non-air-over). Indicate design loads on the name plate.
4. Provide motors which have code letters for locked rotor kVA per horsepower as defined and in accordance with NEMA MG 1.

B. Single Phase Motors
1. Single speed motors: capacitor start, split-phase, or shaded-pole type as approved for individual application.
2. Two-speed motors: two winding, split-phase or two winding, capacitor-start type as approved for individual application.

C. Three-Phase Motors
1. General purpose, T-frame squirrel cage induction type, design "B", across-the-line full voltage starting, unless otherwise specified, with maximum slip of 5 percent and locked rotor and breakdown torques as defined in NEMA MG 1.
2. "Open, "Drip-Proof" or "Totally Enclosed, Fully Guarded", NEMA class B insulation, rated 1.15 service factor, unless otherwise indicated or required by the type of areas in which they are located or by the service.
3. Two-speed motors: of the two winding type.

D. Totally Enclosed Motors
1. Use totally enclosed motors in exposed locations, outdoors, wet locations and where otherwise specified.
2. Totally enclosed motors over 1-1/2 hp: fan cooled.
3. Enclosures: established standards as required and defined by NEMA MG

E. Motor Efficiencies
1. Tabulated below are the minimum acceptable efficiencies and power factors for totally enclosed fan cooled (TEFC) and open drip proof (ODP), three phase motors from 1 thru 200 horsepower at 1200, 1800 and 3600 rpm.
2. The values listed are minimum values in each category and compliance in one or two categories shall not be accepted as justification for a lower value in a second or third category.
3. Base explosion proof motors compliance on ODP values.
4. Provide two-speed motors, small 3 phase motors, and other special motors which are the highest grade and most efficient motor of its type made by the motor manufacturer proposed.

HP & Type	RPM (syn.)	IEE112B nominal Efficiencies, Percent		Power Factor Full Load Percent
		Full Load	Half Load	
1	3600	82	70	82
TEFC	1800	81	78	74
	1200	81	75	54
1-1/2	3600	82	79	85
TEFC	1800	85	83	77
	1200	85	82	62
2	3600	84	82	85
TEFC	1800	82	79	69
	1200	87	45	62
3	3600	86	75	82
TEFC	1800	88	87	78
	1200	89	87	64
5	3600	87	84	84
TEFC	1800	88	87	80
	1200	89	87	68
7-1/2	3600	89	87	85
TEFC	1800	90	91	81
	1200	89	89	80
10	3600	89	88	88
TEFC	1800	90	90	82
	1200	91	90	73
15	3600	90	89	88
TEFC	1800	91	91	81
	1200	91	91	80
20	3600	90	89	89
TEFC	1800	92	92	85
	1200	91	92	80
25	3600	90	90	88
TEFC	1800	93	93	82
	1200	91	93	80
30	3600	91	91	88
TEFC	1800	93	94	82
	1200	91	91	81
40	3600	91	91	85
TEFC	1800	93	93	83
	1200	93	94	86
50	3600	92	91	87
TEFC	1800	94	94	85
	1200	93	94	88
60	3600	92	92	88
TEFC	1800	94	93	85
	1200	93	93	84
75	3600	92	91	89
TEFC	1800	95	94	85
	1200	93	93	83
1	3600	82	72	72
ODP	1800	80	75	61
	1200	77	69	44
1-1/2	3600	83	78	85

ODP	1800	84	80	73
	1200	84	79	64
2	3600	84	79	88
ODP	1800	84	79	70
	1200	86	81	64
3	3600	82	80	88
ODP	1800	86	83	77
	1200	85	83	66
5	3600	85	86	87
ODP	1800	87	85	82
	1200	87	86	70
7-1/2	3600	87	86	87
ODP	1800	89	87	79
	1200	89	86	76
10	3600	88	87	86
ODP	1800	90	89	83
	1200	89	89	82
15	3600	90	89	87
ODP	1800	90	90	81
	1200	90	88	76
20	3600	89	89	89
ODP	1800	90	91	84
	1200	90	89	81
25	3600	90	90	87
ODP	1800	91	91	83
	1200	92	92	80
30	3600	90	89	80
ODP	1800	91	90	85
	1200	92	92	81
40	3600	90	90	88
ODP	1800	94	92	76
	1200	93	93	85
50	3600	92	90	84
ODP	1800	94	93	84
	1200	92	92	85
60	3600	92	91	87
ODP	1800	93	93	84
	1200	93	92	82
75	3600	93	91	87
ODP	1800	94	93	83
	1200	93	93	83

F. Provide motor accessories including:
   1. Grease lubricated bearings.
   2. Type of mounting as required with standard dimensions in accord with NEMA MG 1, Part 3.
   3. Junction box of adequate size to terminate the indicated conduit and wire. Provide special box extensions if necessary. Provide separate lug for ground connection on junction boxes.
   4. Solderless connectors on all leads

G. Manufacturers
   1. Westinghouse, Baldor, Siemens Energy & Automation, Inc., Louis Allis, U.S. Motors (Emerson) or Reliance.

PART 3 EXECUTION

3.1 ERECTION, INSTALLATION, APPLICATION:

A. Identification
   2. Identify panels, control points, starters, disconnect switches, and transformers in accordance with the identification markings as shown.
   3. Where nameplates and other identification labels are located in inaccessible or unreadable locations, provide duplicate identification in an exposed location.
   4. Provide identification by means of anodized aluminum or laminated plastic nameplates.
   5. Identify push buttons, selector switches, and other control devices, by the voltage and equipment controlled.

B. Package Units.
   1. Control enclosures.
      a. "Enclosure" means the metal housing for the control apparatus, whether such housing be a part of the equipment, mounted on the equipment, or separately mounted. "Compartment" means a space within the base, frame, or column of the equipment.
      b. Mount controls in such a manner and position as to be guarded against dirt and dust and readily accessible.
      c. Mount control equipment in a rigid and readily accessible manner, protected so that it cannot be operated by accident and with enough clearance from surrounding surfaces to facilitate removal and replacement.
      d. Mount control enclosure to minimize the possibility of damage from moving equipment and protect against falling and splashing liquids. Minimum distance from bottom of panel to floor, and height and width of door opening shall be adequate for servicing. Do not set panel to such depth as to interfere with inspection and servicing.
      e. Mount front of board-mounted starters, contactors, and other control devices on a rigid panel in such a manner that the complete control panel can be removed through the enclosure opening. Mount each device in turn with machine screws so any unit may be replaced without removing the panel.
   2. Disconnect switches
      a. Provide package units with a main disconnect switch.
      b. Provide disconnect switches in accordance with the provisions of Division 26.
   3. Motor starters and controllers
      a. Provide motor starters and controllers in accordance with the provisions of Division 26.
   4. Control devices
      a. Provide control devices that meet the minimum requirements of the latest revisions of the ANSI and NEMA standards.
   5. Conduit and wiring
      a. Provide conduit and wiring in accordance with the provisions of Division 26.

C. Motor Installation

1. Mount motors where they are easily accessible for maintenance and protected from damage. Provide motor compartments which are clean and dry and adequately vented directly to the exterior of the equipment.
2. When motors are mounted inside of equipment, provide motor compartments of sufficient size to accommodate a motor with terminal enclosures one frame size larger than the maximum frame size recommended by the equipment builder.
3. Arrange motors for ease in checking lubricant levels and replacing belts.
4. Limit static and dynamic balance and noise control for elimination of equipment trouble from these sources. Indicate specially balanced motors as such on the nameplate.
5. Install motors to conform to the requirements of NEMA MG 2

3.2 FIELD QUALITY CONTROL

A. Load Tests.
1. Conduct a load test on all motors and take the current readings. Do not allow the load current exceed the nameplate rating of the motor under any condition. If this condition exists, notify the Architect immediately.

END OF SECTION

SECTION 23 05 02

ADJUSTING AND BALANCING MECHANICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes.
1. This Section includes the adjusting and balancing of the air and hydronic systems for the Project.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements.
1. Adjusting and balancing shall be performed in accordance with the latest edition of the Associated Air Balance Council (AABC) National Standards, and in accordance with the scope of Work specified in the Contract Documents.
2. Adjusting and balancing shall not begin until systems are complete, temporary filters and strainers are removed and permanent filters installed, piping systems are cleaned, flushed and chemically treated, all as properly scheduled and approved in advance by the Architect.
3. In addition to demonstrating that the systems are capable of achieving design load point flows, the adjusting and balancing agency shall demonstrate, and so include in the report forms, that the automatic control systems respond properly to load variations.
4. Upon the completion of the Work, the adjusting and balancing agency shall submit three copies of the complete adjusting and balancing report.
5. One agency shall be responsible for all phases of adjusting and balancing.
6. The adjusting and balancing agency shall permanently mark the settings of all valves, dampers and other adjusting devices in a manner that will allow the settings to be restored. If a balancing device is provided with a memory stop, it shall be set and locked.

1.3 SUBMITTALS:

A. The name of the adjusting and balancing agency, plus the name and registration number of the certified adjusting and balancing engineer, shall be submitted for approval within 30 days after the award of the Project Contract. The selected adjusting and balancing agency shall submit the following:
1. Detailed procedures.
2. Agenda
3. Report (refer to Part 3 for requirements)
4. AABC National Project Performance Guaranty

B. An approved copy of each of the above will be returned to the adjusting and balancing agency before adjusting and balancing is begun.

1.4 QUALITY ASSURANCE:

A. Qualifications.
1. Agency for adjusting and balancing air and hydronic systems.
a. Final reports shall be signed by the certified adjusting and balancing engineer and shall include the engineer's official stamp.

b. Adjusting and balancing shall be performed in complete accordance with AABC standards for field measurement and instrumentation.
c. Submit the name of the adjusting and balancing agency for approval as specified under article "Submittals".
d. If the installing Contractor fails to submit the name of a certified adjusting and balancing agency within the specified period, a certified agency will be selected by the Owner and the Contractor shall be required to issue a purchase order to that agency for the Work as directed.

1.5 SEQUENCING AND SCHEDULING

A. The Contractor shall provide the adjusting and balancing agency with one set of the following documents:
1. Within 30 days after approved selection of adjusting and balancing agency:
a. Contract Drawings.
b. Applicable Specifications.
c. Addenda
2. As issued:
a. Change Orders
3. Within 30 days after approval, applicable shop drawings, including the following items:
a. Sheet metal fabrication and construction drawings.
b. Equipment manufacturer's submittal data.
c. Temperature control drawings

B. Upon receipt of the above listed documents from the Contractor, the adjusting and balancing agency shall evaluate the air and hydronic systems proposed layouts and determine the adequacy of the type, number and location of balancing devices being provided.

C. Any deficiency in the balancing device type, number and location shall be noted by the adjusting and balancing agency and the Contractor shall be so notified.

D. Fabrication and installation of the air and hydronic systems shall not begin until the Contractor has received this report from the adjusting and balancing agency and has taken corrective action.

E. The adjusting and balancing agency shall further be provided with the following:
1. Reasonable time to complete the adjusting and balancing prior to the required completion date.
2. Completely operable systems.
3. The right to adjust the systems.
4. Access to system components.
5. Master keys if the building is occupied.
6. Secure storage space for tools and instruments

F. The Contractor shall ensure that the adjusting and balancing agency's personnel receive the full cooperation and assistance of the personnel of the pipe fitting, sheet metal and automatic control trades during the adjusting and balancing process.

G. The Contractor shall be responsible for start-up and operation of systems during the adjusting and balancing process. Start-up shall include the following:
1. All equipment operable in safe and normal condition.
2. Automatic control systems installed complete and operable.
3. Proper thermal overload protection in place for electrical equipment.
4. For air systems:

a. Final filters clean and in place.
b. Duct systems clean of debris.
c. Correct fan rotation.
d. Fire and volume dampers in place and operational.
e. Coil fins combed and cleaned.
f. Access doors closed and duct end caps in place.
g. All outlets installed and connected.
h. Duct system testing completed and leakage not exceeding the rate specified.

5. For hydronic systems:
a. Flushed, filled, and vented.
b. Correct pump rotation.
c. Proper strainer baskets clean and in place.
d. Temporary start-up strainer baskets removed.
e. Service and balance valves open.
f. Piping systems testing completed and accepted

PART 2 PRODUCTS

2.1 ADJUSTING AND BALANCING EQUIPMENT

A. Instrumentation
1. Provide air system adjusting and balancing instrumentation such as pitot tubes, incline gauge or U-tube manometers or magnehelic gages, alnor velometer, tachometer or rpm counter, insertion thermometers, clamp-on ammeter for motor voltage and ampere readings and others to be able to completely analyze and balance air handling systems. Instrumentation shall be accurately calibrated and checked before usage.

PART 3 EXECUTION

3.1 GENERAL ADJUSTING AND BALANCING PROCEDURES

A. Cooperate with the Owner and Contractor to perform the Work in a manner to meet the job schedule.

B. Leave all system components in proper working order, such as:.
1. Replace belt guards.
2. Close access doors.
3. Close doors to electrical switch boxes.
4. Restore thermostats to specified settings.

C. Recorded data shall represent a true, actually measured, or observed condition.

D. Immediately report to the Architect, any abnormal conditions in the mechanical systems or conditions which prevent a proper adjusting and balancing process.

E. If, for any reason, a system cannot be properly balanced, report that fact to the Architect as soon as observed.

F. Should additional balancing devices be required, notify the Contractor of such.

G. If it is determined by the adjusting and balancing agency that drive changes are required, the Contractor shall obtain and install all necessary new components

3.2 AIR SYSTEMS - ADJUSTING AND BALANCING PROCEDURES

A. Preparation for Air Systems Adjusting and Balancing.
1. Do not begin adjusting and balancing until it is verified that the Contractor has performed the start-up procedures as required in the AABC National Standards.
2. Measure the amperes of all fan motors before adjusting and balancing is started and take proper steps to correct and report any overloads.
3. Do not continue the adjusting and balancing process if any conditions are observed that are hazardous to the air system. Report such conditions before proceeding further.
4. Verify all outlets for compliance with design requirements and report any variations before starting the adjusting and balancing process.

B. Supply, Return and Exhaust Fans
1. Set the rpm of the fans to provide design total cfm within acceptable limits as indicated in the AABC National Standards and/or required static pressure to operate the system.
2. Do not set fan speeds to exceed the maximum allowable as scheduled and as established by the fan manufacturer.
3. The final setting of fan rpm shall not result in overloading the fan motor in any mode of operation. Modulate dampers, and measure the amperes of the supply and return fan motors to ensure that no motor overload can occur. Measure the amperes in the full cooling, heating, and economizer modes to determine the maximum brake horsepower.
4. After adjusting and balancing, record the following values.
   a. Fan rpm
   b. Motor voltage and amperes.
   c. Entering static pressure.
   d. Leaving static pressure.
5. Set the final rpm of the fans to supply and return the required cfm with filters artificially restricted to simulate 50 percent loading. Verify that the fan motors will not be overloaded when the system is operating with unrestricted, clean filters in place.
6. When applicable, base final fan settings on rated wet cooling coil resistance.
7. Set final rpm of the supply and return fans in systems having mixed air dampers to provide required cfm with the system in a logical non-modulating mode: for example, minimum outside air.
8. When job conditions permit, measure static pressure as follows:
   a. Take the static pressure leaving the fan as far downstream from the fan as is practical, but upstream of any restrictions in the duct (such as duct turns).
   b. Do not take any reading directly at the fan outlet or through the flexible connection.
   c. Measure the static pressure entering a single inlet fan in the inlet duct upstream of any flexible connection and downstream of any duct restrictions.
   d. Measure the static pressure entering a double inlet fan through the wall of the plenum which houses the fan.
9. In all cases, take the readings so as to represent as true a value as possible. True value is actual measured static pressure.

C. Supply Air Outlets and Return/Exhaust Air Inlets
1. Measure quantities according to the AABC National Standards. Balance the systems so that the total supply air quantity into and out of each space is within minus 5 percent to plus 10 percent of the design amount.

2. Adjust each outlet and inlet within the same space as related to the above to design quantities. Obtain final quantities without generating noise levels in excess of the design parameters listed on the Drawings.
3. Adjust the pattern for adjustable outlets for proper distribution without drafts.
4. If, during adjusting and balancing process, it is detected that any outlet or inlet conditions that will not allow proper balancing to be performed, report the condition immediately.

D. Filters
1. Under final balanced conditions, measure and record static pressure entering and leaving each filter bank.

E. Coils and Other Devices
1. Under final balanced conditions, measure and record static pressures entering and leaving each coil bank.
2. Measure and record static pressures entering and leaving other devices (such as sound traps, heat recovery equipment, and dampers).

F. Automatic Control Dampers
1. Verify automatic control dampers for proper shut-off when driven closed by the controller. Also verify dampers to be in the same position as indicated by the controller. Refer corrections to the Contractor for remedial action.

G. Mixed Air Control
1. Restrict manual balancing dampers in return, outside, and/or relief air connections as necessary so the system supplies and returns essentially the same cfm in any mode of modulation.
2. Test mixed air plenums for possible stratification. If freeze-up or other serious problems are likely, report the condition at once.
3. Observe the start-up of medium and high pressure systems to check that no dangerous conditions exist. If dangerously low pressure in the fan inlet plenum, or dangerously high pressure in the fan discharge plenum are observed, report or correct at once.
4. Set the minimum outside air quantity to the required value. If this airflow quantity cannot be properly measured, use the temperature method.

H. Specific System Requirements
1. For more specific adjusting and balancing requirements for the types of air systems designed into the Project, refer to the appropriate chapters of the AABC National Standards.

3.3 HYDRONIC SYSTEMS - ADJUSTING AND BALANCING PROCEDURES

A. Preparation for Hydronic Systems Adjusting and Balancing
1. Verify the following before beginning the hydronic system balance:
   a. Systems are completely filled.
   b. Systems are tested.
   c. Systems are clean.
   d. Systems are free of air.
   e. All service valves are open.
   f. All strainers are provided with clean baskets having proper perforations.
   g. Three-way valves are properly piped.
   h. All coils are correctly piped.
   i. Coil fins are straight and clean.
   j. Proper meters, pressure taps, thermometer wells and balancing valves are in place and correctly located.

k. Automatic control system is in operation.
l. There is no entrained air in the suction piping to pumps in an open system which can have a negative effect on the pump performance.
m. The pressure is adequate to completely fill the system.

2. Measure the amperes of all pump motors before hydronic balancing is started and take proper steps to correct and report any overloads.
3. Do not continue the hydronic balancing if at any time hazardous conditions are observed. Report these conditions before proceeding.
4. Include the initial and final readings of all flow-meters on the AABC report form. List all pertinent information regarding each flow-meter, such as:
   a. Designation of terminal.
   b. Manufacturer.
   c. Type.
   d. Size.
   e. Gpm rating.
   f. Pressure differential rating.
5. Take pitot tube traverses where required.

B. General Procedures
1. Measure flow quantities, temperatures and pressures according to the AABC National Standards.
2. If, during the hydronic balancing, it is determined that any conditions exist that will not permit proper balancing, report the condition immediately.
3. At completion of balancing, leave at least one terminal unit balancing valve in each piping branch fully open.
4. At completion of balancing, leave at least one branch pipe balancing valve fully open.
5. Clearly mark the final position of each balancing valve. Set any memory devices to permit closing and reopening the valve to its balanced setting.
6. Verify that all automatic controllers operate the correct control valves. The valve position shall be as indicated by the controller.

C. Flow Meter Balance Procedure.
1. Measure fluid flow quantities using the installed meters provided.
2. Apply any necessary correction factor to the indicated value to account for the density of the fluid flowing in the system.

3.4 FIELD QUALITY CONTROL

A. Performance Tests
1. After equipment has been fully installed and adjusted and systems balanced, conduct a series of conditions, and when necessary, under climatic circumstances which make possible complete and performance tests in the presence of the Architect. Conduct the tests under actual operating comprehensive tests. Perform tests of such number and duration as necessary to show compliance with design requirements.
2. Perform tests that cover the performance of equipment items and of the systems they comprise. Should any system or any equipment item fail to function as required, make such changes, adjustments, or replacements as necessary to meet the performance requirements as shown and specified. Repeat tests until design requirements have been fully satisfied.

3.5 DEMONSTRATION

A. Instruction

1. Instruct the Owner's operating personnel in the operating characteristics of equipment and systems included in this Contract.

B. Operation
1. Operate systems for a period of at least forty-eight hours unless otherwise specified.

C. Cleaning
1. Conduct operations in an orderly manner and maintain clean conditions on the site of the Work.
2. After completion of the Work, leave equipment, piping and ductwork clean and in complete working order.

3.6 ADJUSTING AND BALANCING REPORT

A. Provide the adjusting and balancing report complete with logs, data, and records as required herein. Type all logs, data, and records on white bond paper and bound. The report shall be certified accurate and complete by the adjusting and balancing agency's certified adjusting and balancing engineer.

B. Submit four copies of the adjusting and balancing report.

C. The report shall contain the following general data in a format selected by the Contractor.

Project number
Contract number
Project title
Project location
Project architect
Project mechanical engineer
Adjusting and balancing agency
Adjusting and balancing engineer
General contractor
Mechanical subcontractor
Dates tests were performed
Certification

D. Record the adjusting and balancing report on report forms conforming to the recommended forms in the AABC National Standards. As a minimum, the report shall include:
1. Preface: a general discussion of the system, any abnormalities and problems encountered.
2. Instrumentation list: the list of instruments including type, model, manufacturer, serial number, and calibration dates.
3. System identification: in each report the VAV boxes, zones, supply, return, and exhaust openings, and traverse points shall be numbered and/or lettered to correspond to the numbers and letters used on the report data sheets.
4. Air handling equipment test-report forms: record the following on each air handling equipment test form:
   a. Manufacturer, model number, and serial number.
   b. All design and manufacturer-rated data.
   c. Total actual cfm by traverse if practical; if not practical, the sum of the outlets may be used, or a combination of each of these procedures. For specific systems, such as ones with diversity, see the AABC National Standards.
   d. Suction and discharge static pressure of each fan, as applicable.

e. Outside-air and return-air total cfm.
f. Actual operating current, voltage, and brake horsepower of each fan motor.
g. Final rpm of each fan.
h. Fan and motor sheave manufacturer, model, size, number of grooves, and center distance.
i. Belt size and quantity.
j. Static-pressure controls' final operating set points.

5. Record the following items on each pump test form:
   a. Manufacturer, size, and serial number.
   b. All design and manufacturer's rated data.
   c. Pump operating suction and discharge pressure and final total dynamic head.
   d. No flow (pump discharge valve closed) suction and discharge pressure and corresponding total dynamic head. This procedure is to determine actual impeller size.
   e. Rated and actual operating current, voltage, and brake horsepower of each pump motor.
   f. Submit pump curve showing design, operating, and no-flow points of operation.
6. Record the following items on each chiller test form
   a. Manufacturer, model number, and serial number.
   b. All design and manufacturers' rated data.
   c. Rated and actual pressure drop across evaporators and condensers and related gpm.
   d. Entering and leaving water temperatures.
   e. Rated and actual operating current and voltage.
7. Record the following items on each heat exchanger test form:
   a. Manufacturer and model number.
   b. All design and manufacturers' rated data.
   c. Service and location.
   d. Actual pressure drop and related gpm or steam pressure, primary side.
   e. Actual pressure drop and related gpm, secondary side.
   f. Primary side entering and leaving temperatures.
   g. Secondary side entering and leaving temperatures.
   h. Temperature control setting.
8. Record the following items on each cooling coil test form:
   a. Manufacturer.
   b. All design and manufacturers' rated data.
   c. Rated and actual water pressure drop through each coil and related gpm.
   d. Rated and actual static pressure drop across each coil.
   e. Entering and leaving water temperatures.
   f. Wet-bulb and dry-bulb temperatures entering and leaving each cooling coil; dry-bulb temperatures entering and leaving each heating coil.
9. Test and record the following on each electric-heating-coil test form:
   a. Manufacturer and model number.
   b. All design and manufacturer rated data.
   c. Actual operating current and voltage.
   d. Coil location and identification number.
10. Record the following items on each cooling tower test form:
    a. Manufacturer, model number, and serial number.
    b. All design and manufacturers' rated data.
    c. Entering and leaving wet-bulb and dry-bulb temperatures.
    d. GPM, determined by pump gpm, condenser gpm, or water meter, if installed.

e. Fan rpm.
f. Actual operating current, voltage, and brake horsepower on each motor.
g. Fan and motor sheave manufacturer, model, size, number of grooves, and center distance.
h. Belt size and quantity.
i. Gear drive manufacturer and model number, if applicable.

3.7 FINAL ACCEPTANCE

A. At the time of final inspection, recheck, in the presence of the Architect, specific and random selections of data recorded in the certified adjusting and balancing report.

B. Points and areas for recheck shall be selected by the Architect.

C. Use measurements and test procedures the same as the original test and balance.

D. Selections for recheck, specific plus random, shall not normally exceed 15 percent of the total number tabulated in the report, except where special air systems require a complete recheck for safety reasons.

E. If random tests demonstrate a measured flow deviation of 10 percent or more from that recorded in the certified adjusting and balancing, the report shall automatically be rejected. In the event the report is rejected, readjust and test all systems, record new data, submit a new certified adjusting and balancing report, and make a new inspection test.

3.8 OPPOSITE SEASON TEST

A. Perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. Make any necessary modifications to the initial adjustments to produce optimum system operation.

END OF SECTION

SECTION 23 7 00

HVAC INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes the thermal insulation for heated and cooled mechanical equipment, piping and ductwork provided in other Sections of Division 23.

1.2 REFERENCES

A. American Society of Testing and Materials (ASTM)
1. C177 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
2. C335 - Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
3. C356 - Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.
4. C411 - Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
5. C518 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
6. C533 - Specification for Calcium Silicate Block and Pipe Thermal Insulation.
7. C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Insulation in Sheet and Tubular Form.
8. C547 - Specification for Mineral Fiber Preformed Pipe Insulation.
9. C553 - Specification for Mineral Fiber Blanket and Thermal Insulation for Commercial and Industrial Applications.
10. C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
11. C795 - Specification for Wicking - Type Thermal Insulation for Use Over Austenitic Stainless Steel.
12. C1136 - Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
13. D1056 - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
14. D1149 - Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber.
15. E84 - Test Method for Surface Burning Characteristics of Building Materials.
16. E119 - Method for Fire Tests of Building Construction and Materials.
17. E96 - Test Method for Water Vapor Transmission Materials.
18. E136 - Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

B. Midwest Insulation Contractors Association (MICA)
1. National Commercial and Industrial Insulation Standards.

C. National Fire Protection Association (NFPA)
1. 90A - Standard for Installation of Air-Conditioning and Ventilating Systems.
2. 90B - Installation of Warm Air Heating and Air Conditioning Systems.

D. Underwriters Laboratories Inc. (UL)790 - Test for Fire Resistance of Roof Covering Materials..

1.3 DEFINITION OF LOCATIONS SCHEDULE

A. Finished and Unfinished Areas
   1. "Finished areas" are areas where floor, walls, ceilings, trim, or exposed steel are painted, tiled, or similarly finished.
   2. "Unfinished areas" are areas with unpainted walls.

B. Exposed and Concealed Areas
   1. "Exposed areas" are finished areas and other areas used by personnel in the normal use of the building, such as boiler room, fan rooms, mechanical rooms, and storage rooms'.
   2. "Concealed areas" are pipe tunnels, covered pipe trenches, spaces inside walls, duct or pipe shafts, spaces above dropped ceilings, unfinished attic spaces, crawl spaces, and space below access floor.

1.4 SYSTEMS DESCRIPTIONS

A. Design Requirements.

   1. Air handling apparatus and ductwork
      a. Air handling apparatus and ductwork to be insulated;
         (1) Air conditioning supply and return air ducts .
         (2) Supply and return air plenums

1.5 SUBMITTALS

A. Submit description, heat transfer coefficients, characteristics, and compliance with specified flame spread and smoke development ratings for insulation, jackets and adhesives on insulated systems.

B. Submit schedules of thicknesses for each insulated system, including each pipe size for each insulated piping system.

C. Submit Samples of each type of insulation and insulation system proposed for use on the Project.

D. Refer to Section Div. 1.

1.2 WARRANTY

A. Refer to Section Div. 1.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide insulation, binders, jackets, adhesives, coatings, tapes and sealers furnished under this Section which are listed and labeled by Underwriters Laboratories Inc. and have a flame spread rating of 25 or less and smoke development rating of 50 or less when tested in accordance with ASTM E84, unless otherwise specified. (Elastomeric cellular pipe insulation shall comply only for thicknesses less than 1-inch.)

B. Provide pipe insulation in pre-molded, three-or-six-foot long sections, split ready for application.

C. Do not use wheat paste, mold-breeding and mold-sustaining organic materials.

D. Provide insulation materials which are 100 percent asbestos free.

2.2 MANUFACTURERS

A. Fiberglass Insulation: Owens-Corning Fiberglas Corporation; Manville; Certainteed Corp.; Keene Building Products Corp; Armstrong World Industries, Inc.; Manson Insulation, Inc.; or Knauf Fiber Glass.

B. Elastomeric cellular thermal pipe insulation: Armstrong "AP Armaflex"; Accessible Products Co. "Techlite"; Halsted "Insultube"; or Insulation Materials Corporation of America (IMCOA) Imcolock or Imcoshield.

C. Adhesives, mastics, coatings and sealants: Foster Products Div., H.B. Fuller Co.; I-C Adhesives Co.; Chicago Mastic Co.; Childers Products Co. or St. Clair Rubber Co.; and as specified in Part 3 – Execution.

2.3 DUCTWORK SCHEDULE

A. For All Ductwork except for exposed ductwork in finished areas:
Glass fiber, flexible blanket insulation with a thermal conductivity of 0.27 BTU/(hr) (sq.ft.) (degree F/in) at 75 degrees F mean temperature and a density of 0.75 lb/cu.ft. and a vapor retardant jacket of aluminum foil reinforced with fiberglass yarn and laminated to a fire-resistant Draft, secured with UL listed pressure sensitive tape. Provide insulation conforming to the following standards:

ASTM C1136 NFPA 90A
ASTM E84 NFPA 90B

B. Ductwork systems insulation R-Value:

1. Concealed supply and return air ductwork: 6
2. Outdoor supply and return air ductwork: 8

C. Gymnasium Ductwork System:

1. Exposed supply air ductwork inside the Multi-Purpose Gymnasium space shall be internally lined with a 1-inch IAQ liner.

2.4 INSULATION PROTECTION

A. Indoor Applications

1. Provide insulation protection on the following

a. Cooled Systems: cover all cooled piping, ductwork and equipment insulation with a vapor retarder. Cover all cooled piping ductwork and equipment exposed below 3 meters (10 feet) above a floor or other walking surface with PVC or aluminum jacketing. PVC jacketing to have a flame spread rating of 25 or less and a smoke developed rating of 50 or less per ASTM E84.

B. Outdoor Applications

Provide insulation protection on all outdoor insulated piping, ductwork and equipment.
On heated, non-cellular insulated surfaces provide insulation protection consisting of PVC jacketing laminated to a 0.5 mm (0.020-inch) thick stucco embossed aluminum jacket.
On cooled, cellular insulated surfaces provide insulation protection consisting of a PVC jacketing laminated to a 0.5 mm (0.020-inch) thick stucco embossed aluminum jacket.
Composite jacket product: Proto PVC Corp. "VINALUM" Childers Products Company "ULTRALON".

PART 3 EXECUTION

3.1 GENERAL APPLICATION REQUIREMENTS

A. Install insulation, adhesives, coatings, mastics, sealants and tapes, only by experienced pipe coverers, in compliance with MICA standards.

B. When building structures or equipment interfere with the insulation, coordinate installation with other trades.

C. Protect work of other trades from debris caused by the insulation work. Remove debris daily.

D. Provide removable sections of insulation or insulation boxes at all points where access is required. Assemble sections and boxes and install so disassembly, removal, and replacement will not damage the insulation.

E. Provide a minimum of 1/4-inch-thick coverage over sheet metal joints and stiffeners.

F. Do not insulate nameplates.

G. Provide insulation support on vertical piping, duct and equipment on maximum 12-foot spacing. Supports shall project 1/2-inch less than insulation thickness.

H. Clean surfaces to be insulated, and make dry and free of loose scale, rust, dirt, oil and water before insulation, adhesives or mastics are applied.

I. Install insulation smooth and clean. Make joints tight and finished smooth. Do not use cracked, chipped, or torn insulation sections in the Work.

J. Provide thickness of the insulation the maximum specified or shown.

K. Make joints tight with insulation lengths and segments tightly butted against each other. Where lengths or segments are cut, make cuts smooth and square and without breakage of end surfaces.

L. Apply outdoor aluminum weatherproof covering over insulation in such a manner as to be entirely weatherproof and watertight

M. Make up joints with the proper system adhesive and three-inch-wide (minimum) tape of same material as the jacket.

N. Position longitudinal joints on the bottom of the pipe.

O. Where vapor barrier jackets are used on cold surfaces, apply insulation with vapor seal integrity maintained throughout the entire system.

P. On cold piping and equipment, install insulation completely vapor sealed and free of penetrations and other openings.

Q. Fit insulation tightly against surface to which it is applied.

R. Do not apply sealant or cement until previous applications of adhesives and cement have thoroughly dried.

S. Conduct required tests on piping, equipment and ductwork, and make corrections, if required, prior to application of insulation.

T. Apply insulation so as to permit expansion and contraction of pipe lines without causing damage to insulation or surface finish.

U. Provide premolded pipe insulation with extended leg when used on pipes heat-traced with piping or cable.

V. Insulate all flanges on both cold and hot piping systems, including bonnet flanges on valves; insulate valves up to the gland. Provide insulation on flanges with overlap of the adjacent pipe covering by two inches and pack the void space with insulation and finish with insulating cement.

W. For equipment insulated with fiberglass insulation in mechanical equipment rooms or in finished spaces, finish with Zeston, Proto or Ceel-Co jacketing and fitting covers or aluminum jacketing.

X. Extend duct insulation on air conditioning supply air systems up to and around the supply air diffuser body.

Y. Run pipe insulation and vapor barrier jackets continuous through sleeves and openings in walls and floors.

Z. Insulate pipe line strainers and provide with removable insulation boxes over the basket cover flange.

AA. Restore existing insulation and surface finishes disturbed or damaged during the course of the work to original condition.

BB. Provide insulation jackets as specified.

CC. Provide insulated surfaces ready to receive a final coat of paint without the necessity of sizing or priming.

3.2 AIR HANDLING APPARATUS AND DUCTWORK INSULATION APPLICATION

A. Flexible Insulation.
1. Firmly adhere flexible insulation to ducts with full coverage of fire retardant adhesive, such as Foster 85-20 or Childers Products CP-82. Butt insulation closely and wrap around the duct.
2. For flexible insulation on ducts 24 inches or more in width, use both adhesive and mechanical fasteners on the bottom of the duct to guard against possible sagging. Provide mechanical fasteners and spacing as specified for rigid board insulation.
3. Paste laps of covering in place with adhesive, such as Foster 85-20 or Childers Products CP-82. Where insulation has been trimmed flush, seal joints with butt

strips of facing material as recommended by the manufacturer of the insulation. Tape pin penetrations, punctures and joints.

B. Covering for outdoor fiberglass insulated rectangular ducts and equipment.

1. Secure aluminum watertight with mechanical fasteners, bands or screws. Cover irregular surfaces with vinyl-acrylic mastic such as Childers Vi-Cryl CP-10/11, or as approved, minimum 1/8-inch dry film thickness, reinforced with 5 x 5 mesh glass fabric embedded in final coat.

C. Outdoor Applications

Provide insulation protection on all outdoor insulated piping, ductwork and equipment. On heated, non-cellular insulated surfaces provide insulation protection consisting of PVC jacketing laminated to a 0.5 mm (0.020-inch) thick stucco embossed aluminum jacket. On cooled, cellular insulated surfaces provide insulation protection consisting of a PVC jacketing laminated to a 0.5 mm (0.020-inch) thick stucco embossed aluminum jacket. Composite jacket product: Proto PVC Corp. “VINALUM” Childers Products Company “ULTRALON”.

END OF SECTION

SECTION 23 23 00

REFRIGERANT SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes.
   1. This Section of the Specifications provides for the refrigeration system for the Project.

1.2 REFERENCES

A. Air-Conditioning and Refrigeration Institute (ARI)
   1. 760 -Solenoid Valves for Use with Volatile Refrigerants.

B. American Society of Mechanical Engineers (ASME)
   1. Boiler and Pressure Vessel Code, Section IX Welding and Brazing Qualifications.
   2. B31.5 - Refrigerant Piping.

C. American Society of Heating and Refrigerating Engineers (ASHRAE)
   1. Standard 15 - Safety Code for Mechanical Refrigeration.

D. American Welding Society (AWS)
   1. BRH - Brazing Handbook.

1.3 SUBMITTALS

A. Refer to Section 23 05 00.

B. Product data for the following products:
   1. Each type valve specified.
   2. Each type refrigerant piping specialty specified.

C. Shop Drawings showing layout of refrigerant piping, specialties, and fittings including, pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and proximate to equipment.

D. Brazer's Certificates signed by Contractor certifying that brazers comply with requirements specified under "Quality Assurance" below.

E. Maintenance data for refrigerant valves and piping specialties, for inclusion in Operating and Maintenance Manual specified in Section 15010.

1.4 QUALITY ASSURANCE

A. Quality brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code.

B. Regulatory Requirements: Comply with provisions of the following codes:
   1. ASME B31.5.
   2. ASHRAE Standard 15.

1.5 WARRANTY

A. Refer to Section 23 05 00.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Refrigerant Valves and Specialties
1. Danfoss Automatic Controls.
2. Henry Valve Company.
3. Parker Hannifin Corporation.
4. Sporlan Valve Company

2.2 MATERIALS

A. Pipe and Tubing, Fittings and Joining Materials
1. Refer to Division 22.

B. Valves
1. Refer to Div. 22.

C. Refrigerant Piping Specialties
1. Strainers
a. 3450 kPa (500 psig) maximum working pressure; forged brass body with monel 80-mesh screen, and screwed cleanout plug; Y-pattern, with solder end connections.
2. Moisture/Liquid Indicators
a. 3450 kPa (500 psig) maximum operation pressure, 93 deg C (200 deg. F) maximum operating temperature; forged brass body, with replaceable polished optical viewing window, and solder end connections.
3. Filter-Dryers
a. 3450 kPa (500 psig) maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter-drier core kit, including gaskets. Provide desiccant sieves of the high capacity type to provide micronic filtration and extra drying capacity.
b. 2410 kPa (350 psig) maximum operation pressure, 107 deg C (225 deg. F) maximum operating temperature; steel shell, and wrought copper fittings for solder end connections. Provide permanent filter element of molded felt core surrounded by a desiccant.
4. Suction Line Filters
a. 3450 kPa (500 psig) maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter core kit, including gaskets.
5. Flanged Unions
a. 2760 kPa (400 psig) maximum working pressure, 149 deg C (300 deg. F) maximum operating temperature; two brass tailpiece adapters for solder end connections to copper tubing; flanges for 22-mm (7/8-inch) through 41-mm (1-5/8-inch) unions: forged steel; flanges for 54-mm (2-1/8-inch) through 79-mm (3-1/8-inch): ductile iron; four plated steel bolts, with silicon bronze nuts and fiber gasket. Provide flanges and bolts with a factory-applied rust-resistant coating.

6. Flexible Connectors
   a. 3450 kPa (500 psig) maximum operating pressure; seamless tin bronze or stainless steel core, high tensile bronze braid covering, solder connections, and synthetic covering; dehydrated, pressure tested, minimum 175 mm (7 inches) in length

PART 3 EXECUTION

3.1 PIPING INSTALLATION

A. Install refrigerant piping in accordance with ASHRAE Standard 15.

B. Install piping in as short and direct arrangement as possible to minimize pressure drop.

C. Install piping for minimum number of joints using as few elbows and other fittings as possible.

D. Install branch lines to parallel compressors in identical pipe lengths and in complete symmetry.

E. Install horizontal hot gas discharge piping with 1:240 (1/2 inch per 10 feet) downward slope away from the compressor.

F. Install horizontal suction lines with 1:240 (1/2 inch per 10 feet) downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.

G. Install traps and double risers where indicated, and where required to entrain oil in vertical runs.

H. Liquid lines may be installed level.

I. Install moisture/liquid indicators in liquid lines between filter/dryers and thermostatic expansion valves and in liquid line to receiver.

J. Install moisture/liquid indicators in lines larger than 54-mm (2-1/8-inch) od, using a bypass line.

3.2 PIPE JOINT CONSTRUCTION

A. Comply with the procedure contained in AWS BRH.

B. Fill pipe and fittings during brazing, with an inert gas (ie., nitrogen or carbon dioxide) to prevent formation of scale.

C. Heat joints using oxy-acetylene torch. Heat to proper and uniform brazing temperature.

3.3 VALVE INSTALLATION

A. Install refrigerant valves where indicated, and in accordance with manufacturer's instructions.

B. Install globe valves on each side of strainers and dryers, in liquid and suction lines at evaporators, and elsewhere as indicated.

C. Install a full sized, 3-valve bypass around each drier.

D. Install solenoid valves ahead of each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at the top.

3.4 INSTALLATION OF THERMOSTATIC EXPANSION VALVES

A. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.

B. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.

C. Install the valve in such a location so that the diaphragm case is warmer than the bulb.

D. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount bulb in a trap or at the bottom of the line.

E. Where external equalizer lines are required, make the connection where it will clearly reflect the pressure existing in the suction line at the bulb location.

3.5 FIELD QUALITY CONTROL

A. Inspect, test, and perform corrective action of refrigerant piping in accordance with ASME B31.5, Chapter VI.

B. Repair leaking joints using new materials, and retest for leaks

3.6 ADJUSTING AND CLEANING

A. Verify actual evaporator applications and operating conditions, and adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

B. Adjust controls and safeties. Replace damaged or malfunctioning controls and equipment with new materials and products.

3.7 COMMISSIONING

A. Charge system using the following procedures:
   1. Install core in filter dryer after leak test but before evacuation.
   2. Evacuate refrigerant system with vacuum pump until temperature of 1.7 deg. C (35 deg. F) is indicated on vacuum dehydration indicator.
   3. During evacuation, apply heat to pockets, elbows, and low spots in piping.
   4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
   5. Break vacuum with refrigerant gas, allow pressure to build up to 14 kPa (2 psi).
   6. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventative maintenance of refrigerant piping, valves and specialties.

END OF SECTION

SECTION 23 31 00

DUCTWORK AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes.
1. Rectangular ductwork.
2. Round and flat oval ductwork.
3. Special duct systems.
4. Duct acoustical lining.
5. Flexible ducts.
6. Hangers and supports.
7. Access panels.
8. Easements.

1.2 REFERENCES

A. American Conference of Governmental Industrial Hygienists (ACGIH)
1. Industrial Ventilation Manual.

B. American Society of Mechanical Engineers (ASME)
1. B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).

C. American Society for Testing and Materials (ASTM)
1. A123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. A527 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
3. D572 - Test Method for Rubber-Deterioration by Heat and Oxygen.
4. E84 - Test Method for Surface Burning Characteristics of Building Materials.

D. National Fire Protection Association (NFPA)
1. 90A - Installation of Air Conditioning and Ventilating Systems.
2. 90B - Installation of Warm Air Heating and Air Conditioning Systems.
3. 255 - Test of Surface Burning Characteristics of Building Materials.

E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
1. HVAC Duct Construction Standards - Metal and Flexible. (First Edition - 1985)
2. Ducted Electric Heat Guide for Air Handling Systems.
3. Round Industrial Duct Construction Standards.
4. Rectangular Industrial Duct Construction Standards.
5. Accepted Industry Practice for Industrial Duct Construction.

F. Underwriters Laboratories Inc. (UL)
1. 181 - Factory Made Air Ducts and Connectors.
2. 723 - Test for Surface Burning Characteristics of Building Materials.
C.

G. Products Furnished and Set Under Other Sections

1. Certain equipment and fixtures are furnished and set under other Divisions and require Work to be performed under this Section. This Work consists of connections to the following equipment:

   Kitchen exhaust hoods
   Kitchen dishwashers

1.3 SUBMITTALS

A. Shop Drawings
   1. Refer to Div. 1.

B. Opening Location Drawings
   1. As soon as possible after the award of Contract, submit installation drawings which show exact dimensions and locations of openings required in concrete floors, roofs and walls for ducts, air intakes and exhaust, roof exhausters and duct layout and details.

C. Fabrication and Construction Drawings
   1. Submit fabrication and construction drawings for all sheet metal to be installed for the Project, drawn at a minimum scale of 1/4 inch equal to 1 foot. Dimension sheet metal ducts and locate them in both plan and elevation. In addition to plans, include those sections and details required to indicate the manner in which the work is to be installed. Also indicate the location of the work of other trades, including piping, structural, and electrical where potential interferences exist, to insure and demonstrate that the Work has been properly coordinated.
   2. Also show the location of all control elements, including automatic and smoke control dampers, smoke detectors, static pressure probes, flow sensing and measuring devices.
   3. Submit ductwork Shop Drawings in a timely manner. A directive for removal will be issued for any ductwork installed prior to the receipt of approved Shop Drawings.

1.4 QUALITY ASSURANCE

A. Comply with the construction requirements of this Specification in their entirety. Should field inspection determine that deviations from these specifications have been made, the contractor will be directed to bring the installation into compliance at the Contractor's expense.

1.5 WARRANTY

A. Refer to Div. 1.

PART 2 PRODUCTS

2.1 MATERIAL FOR DUCT AND RELATED SHEET METAL WORK

A. Fabricate supply ducts, return ducts, and exhaust ducts, plenum chambers, housings, panels, unless otherwise specified, from zinc-coated (galvanized) steel, lock-forming quality sheets conforming to ASTM A527. Zinc coating thickness: "Commercial" class G90, except a minimum of 2 oz. per sq. ft. where the metal is exposed to the weather or used in housings for cooling coils, or where moisture will be present.

B. Gage numbers of metals indicated or specified represent the manufacturers' standard gage numbers, prior to galvanizing.

C. Companion angles for galvanized ductwork: galvanized angle bolted together with cadmium plated bolts and nuts with gasket or caulking.

D. Refer to the Drawings for duct pressure classifications, or as defined herein.

2.2 RECTANGULAR DUCTWORK

A. Construct all rectangular ductwork in conformance with SMACNA "HVAC Duct Construction Standards - Metal and Flexible - First Edition - 1985".

B. For ductwork with negative static pressures in excess of 3 inches w.g., construct ductwork in conformance with SMACNA "Rectangular Industrial Duct Construction Standards" and "Round Industrial Duct Construction Standards".

C. As an option, construct rectangular ductwork transverse joints using proprietary formed on/slide on flanges, provided they conform to all the criteria of Section VII of SMACNA "HVAC Duct Construction Standards - Metal and Flexible - First Edition-1985", Fundamental Criteria for Demonstrating Equivalency. If this option is exercised, submit independent testing data attesting that joint and ductwork deflection criteria are satisfied.

D. On ductwork up to 2-inches w.g., with a maximum longest side of 48 inches, the proprietary formed-on flange may be used but must be constructed per the SMACNA Non-Proprietary T-24 Formed Flange Duct Construction Standards.

E. On ductwork with the longest side 36 inches and larger, the proprietary slide-on flange may be used but must be constructed per the SMACNA Non-Proprietary T-22 Duct Construction Standards.

F. On all rectangular transverse flanged connections, provide butyl gasket equal to Ductmate 440 or as approved.

G. For rectangular ductwork exposed to the weather, use continuous metal cleats on the top joints of the
ducts.

H. Use only Pittsburgh lock seam for all longitudinal seams.

I. Construct all rectangular ductwork to the following:

1.	Supply ductwork	Upstream of VAV Boxes	Positive 4" w.g.
	Downstream of VAV Boxes		Positive 1" w.g.
	Return Air Ductwork		Negative 2" w.g

2.3 ROUND DUCTWORK

A. Conform to the SMACNA "Duct Construction Standards - Metal and Flexible", SMACNA "Round Industrial Duct Construction Standards", SMACNA "Accepted Industry Practice for Industrial Duct Construction", and ACGIH "Industrial Ventilation Manual"; except where provision of this Specification requires otherwise.

2.4 ROUND "TAKE-OFF" FITTINGS

A. Use round "take-off" fittings whenever round branch connectors are required to be made to rectangular supply air ducts.

B. As manufactured by Flexmaster of Houston Texas.

C. Flexmaster Spin Collar type fittings for sheet metal duct systems. Provide fittings with an integral damper.

D. Provide fittings conforming to the following "Flexmaster" model numbers:
1. Model FLD at duct run-outs to diffusers.
2. Model CBD at duct run-outs to air terminal devices.

2.5 SPECIAL DUCT SYSTEMS

1. Kitchen Range Hood Exhaust Ductwork
Fabricate kitchen range hood exhaust ductwork of No. 10 gage black steel sheet. Gasketing material at access panels: high strength, asbestos free, ceramic fiber, rated at 870 degrees C (1600 degrees F) continuous service; Cotronics Corp. "395HT-Thermeez", or as approved, 3 mm (1/8 inch) thick by 38 mm (1-1/2 inches) wide.

2. Dishwashing Machine Exhaust Ductwork
Fabricate dishwashing machine exhaust ductwork of No. 18 gage type 304 stainless steel with all welded construction.

2.6 SEALING COMPOUND AND TAPE

E. As manufactured by United McGill Corporation; Foster Products Div., H.B. Fuller Co. or 3M, UL classified and complying with NFPA 90A, Class 1 requirements (flame spread of 25 and smoke developed of 50) when applied in a manner consistent with their intended use.

F. United McGill Corporation's "United Duct Sealer", Solvent-based sealant with a solids content in excess of 70 percent and durability exceeding 750 hours without becoming brittle under ASTM D572 test conditions. (For indoor installation only).

G. For outdoor installation: United McGill Corporation's "UNI-Weather", neoprene-based sealant with a solids content in excess of 50 percent and durability exceeding 1000 hours without becoming brittle under ASTM D572 test conditions.

H. For sealing of duct installed elements such as filters, coils, sound attenuators, or air flow monitoring stations, provide United McGill Corporation "Uni-Gasket" flange sealer.

2.7 FLEXIBLE DUCTS

I. Provide complete composite flexible duct assemblies which meet the Class 1 requirements of NFPA 90A and 90B, and labeled by Underwriters Laboratories Inc., with a flame spread of 25 or less, and a smoke developed rating of 50 or under, in compliance with UL 181.

J. Rated for a minimum of 12-inches water gage positive static pressure and minus 2-inches water gage negative static pressure.

K. Factory fabricated assembly consisting of a zinc-coated spring steel helix, non-perforated inner liner, wrapped with a nominal one-inch-thick 1 lb./cu. ft. density glass fiber insulation, sheathed in a vapor barrier jacket factory sealed at both ends of each section.

L. Owens-Corning Flexmaster Type 4M or Thermaflex M-KC.

2.8 HANGER AND SUPPORT MATERIALS

C-Clamps

Steel or malleable iron with hardened steel cup-point set screw and lock-nut, Grinnell Figure 86, Elcen Figure 19A, or Carpenter and Patterson Figure 196. Friction, spring steel, beam clip type hangers are unacceptable.

Retaining clips: Grinnell Figure 89, Elcen Figure 29B, or Carpenter and Paterson Figure 22.

Galvanize C-clamps and retaining clips in accordance with ASTM A123.

Hanger Supports and Attachments

Provide all threaded type hanger rods of galvanized carbon steel complying with ASME B1.1, Class 2A Fit USS National coarse thread, tensile point 55/70,000 psi, yield 35/55000 psi.

3 ACCESS PANELS

Provide panels in insulated ductwork of triple wall insulated type equal to the "Sandwich" panel as manufactured by Ductmate Industries. Panels shall have a neoprene gasket seal and securing knobs with helical springs.

Panels in un-insulated ductwork to be single panel flush type of the same gage and material as the ductwork.

Provide insulated access panels at humidifiers equal to Safe Air Inc. SAC-1P (double glass) for cold ducts and Model SAC-1G (single glass) for all other ducts.

PART 3 EXECUTION

3.1 ERECTION, INSTALLATION, APPLICATION

A. Hangers and Supports

1. Install hangers and supports in conformance with the requirements of the SMACNA "Duct Design Construction Standards", except where provisions of this specification require otherwise.
2. Support vertical ducts through floor slabs on two sides by steel angles bolted to the duct and rest with ample bearing surface on the floor slab. Bolt supporting angles to the floor, ceiling, or wall. Provide supporting angles of size 1-1/2-inch x 1-1/2-inch x 1/8-inch for ducts up to 48 inches wide and 2-inch x 2-inch x 3/16-inch for ducts over 48 inches wide. In open shafts, provide additional structural members to span openings for support of ducts and angles at each floor. Support ducts along walls spaced not more than eight feet apart.
3. Maintain the maximum headroom possible under ducts and supports and in no case be less than eight feet above the floor except where shown or with specific written approval of the Architect.
4. Support ductwork supported by steel straps from the bottom flange of beams by means of C-clamps. Place the steel strap on the upper face of the bottom flange of the beam with the set screw of the C-clamp bearing on the strap. Place C-clamps on the up-stream side of the beam.
5. Support ductwork supported by rod from the bottom flange of beams by C-clamps with retaining clips. Place C-clamps on the up-stream side of the beam.

6. If galvanized ductwork is welded or coating is disturbed, paint the disturbed areas to maintain the corrosion resistant surface of the galvanizing.
7. Exercise care not to overtighten the set screw on C-clamps and thereby over-stress the jaw.
8. Furnish inserts and make provisions for their installation. Whenever hanger rods for ducts cannot be supported from the structural steel or from inserts in the concrete, provide any additional steel, as required. All additional steel to be prime painted.
9. Support ductwork directly from the building structure and not from the supporting systems, roof deck, or equipment of other trades.
10. Cover sharp corners and edges of exposed ductwork and its supporting and reinforcing materials less than seven feet above the floor with prefabricated soft rubber pads, caps or equivalent to prevent injury to personnel.

B. Access Panels in Ductwork
1. Provide access panels of adequate size in ductwork to permit cleaning, inspection, adjustment and maintenance of the duct system and components such as automatic, fire or smoke dampers, control devices, coils and humidifiers.
2. Install panels to open against air pressure to utilize air pressure in sealing of gaskets.
3. Install panels rigidly framed, hinged and gasketed to prevent air leakage.

C. Easements
1. Provide necessary easements in sheet metal work for pipes, conduit equipment, building construction and headroom even though not specifically shown. Provide transformations that maintain the equivalent duct area and have good aerodynamic proportions. Where an obstruction absolutely cannot be avoided and must penetrate the duct, form a streamlined collar around the obstruction. When the duct area is reduced more than 10 percent by the collar, increase the duct size to maintain the original duct area.

D. Offsets in Ducts
1. Make offsets in ducts to avoid interferences or adjust the horizontal or vertical position of the duct, whether or not these are specifically shown.
2. Make offsets with radius turns or mitered turns with the appropriate turning vanes.
3. Offsets that reduce the cross-sectional flow area of the duct will not be permitted.

E. Flexible Ducts Installation
1. Install flexible ducts in air extended condition free of sags and kinks, using the minimum length required to make the connection. Maximum length of any flexible duct section in any run shall be 3 feet with a maximum unsupported length of 1-1/2 feet.
2. Assemble flexible duct to the ductwork by sealing the inner liner to the duct and applying 3-wraps of tape and clamping the insulation and outer liner with a steel band. Clamp flexible duct to air supply diffuser boots without sealer.
3. Use of flexible ducts on return or exhaust ductwork is not permitted.

F. Sealing Compound and Tape Application
1. Seal all transverse joints and longitudinal seams to conform to SMACNA Class A sealing requirements per SMACNA 1985 manual.
2. Seal all metallic duct seams, joints, fastener penetrations, and connections. Apply sealing compound and tape in accordance with the manufacturer's recommendations.
3. Coat round factory fabricated ducts, fittings and round flexible ducts on the male end only after preliminary joining is made with a duct lap of 1/2 to 3/4 inch. After

joint is made with a duct lap of 2 to 4 inches depending on diameter of duct, apply a second coat of sealing compound over the joint. Before sealing compound dries, immediately apply the 2-inch wide sealing tape with 1-inch overlap on each side of joint.

4. In addition to the foregoing round field made ducts, completely seal longitudinal seams with sealing compound and tape applied to the outside of the seam with 1-inch overlap on each side of seam.
5. Use sheet metal screws or rivets approximately 8 inches on centers on round ducts to hold joints in place while sealing compound cures. Thoroughly seal screws and rivets with sealing compound and tape.
6. Coat rectangular duct drive and "S" cleat joints with sealing compound before the cleat is driven on and again after it is in place, with tape applied over the joint with 1 inch of tape overlap on each side of joint.
7. Seal longitudinal seams with sealing compound when fabricated and tape when installed.
8. Use extreme care when applying sealing compound to prevent any build up of sealer on the inside surface of ductwork where it will interfere with the air movement.

3.2 FIELD QUALITY CONTROL

A. Testing Ductwork.

1. On air systems where no portion thereof exceeds 2500 fpm velocity or 2 inches of water gage static pressure, follow the following procedure.
   a. Operate and test systems in accordance with the procedures and codes governing such systems. System components shall function without vibration or excessive noise at any air flow or fan speed up to and including full capacity of the system
   b. Record the actual and required data in a test form. Test form shall include the following:
      (1) Manufacturer's name, model number, and size of fan or unit tested.
      (2) Fan rpm, capacity and motor nameplate data, listing horsepower, amperes, voltage characteristics and rpm.
      (3) Required and actual data on fans, motors, grilles, registers and diffusers, position of automatic dampers during test, and other pertinent data to provide the basis for a complete engineering analysis of the systems.
      (4) This data shall be submitted before acceptance of the system. Provide six copies of the test data for systems.
   c. Test and determine total cfm supply and/or return/exhaust of fans and system leakage by pitot tube and inclined gauge manometer or magnehelic gauge to establish air flow in ducts using joints for traverse as indicated and where directed. The addition of the total air at diffusers and registers shall be compared to the traverse readings to establish the total system leakage.
   d. Maximum total system leakage: one percent of the system flow capacity.
2. On air systems where any portion thereof exceeds 2500 fpm velocity or 2 inches of water gage static pressure, follow the following procedure:
   a. Test for leaks before operating system and before insulation is applied and ceilings or enclosures are erected. As installation progresses, cap sections of ductwork and test the sections at 50 percent above operating pressure with an allowable leakage in cfm not to exceed five percent of the volume in cubic feet of the duct, housing or plenum section under test. Maximum permissible leakage for the entire system: less than one per cent of the system flow capacity.

b. Use test equipment consisting of a 1000 cfm high pressure blower, an orifice test pipe assembly, which is individually calibrated with its own calibration curve, a diffusion plate, an orifice section and a "U" tube manometer and gage board complete with valves and tubing, such as United Sheet Metal Company duct test kit.

c. If the leakage exceeds the allowable limit or leaks can be detected by ear even though the leakage does not exceed the limit, seal leaks with sealing compound and sealing tape. If the leaks are above the allowable limit and cannot be detected by ear, then use a soap bubble test.

3. Ductwork downstream of VAV boxes need not be tested.

3.3 CLEANING OF DUCTWORK

A. Clean all ductwork interiors prior to being tested.

B. Clean ductwork interiors by forcing air at a minimum of twice the maximum design velocity through the system or by means of high-powered vacuum cleaners.

C. Achieve high velocity air through the systems by either blanking parts of the system off and using the system fans or by providing separate high velocity blowers.

D. Protect equipment and other system components which may be harmed by excessive dirt with temporary filters or by-pass during cleaning operations.

END OF SECTION

SECTION 23 3300

DUCTWORK ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes.
   1. Sound Attenuators
   2. Turning Vanes
   3. Dampers
   4. Grilles, Registers and Diffusers

B. Products Installed but not Furnished Under This Section.
   1. Automatic and smoke control dampers.

1.2 REFERENCES

A. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)
   1. 1992 Handbook - HVAC Systems and Equipment.

B. American Society for Testing and Materials (ASTM)
   1. E84 - Test Method for Surface Burning Characteristics of Building Materials.
   2. E477 - Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.

C. Institute of Environmental Sciences (IES)
   1. CS-1T - Standard for HEPA Filters.
   2. CS-2T - Standard for Laminar Flow Clean Air Devices.

D. Military Standard and Specifications
   1. Mil-Std-282 - DOP Smoke Penetration and Air Resistance of Filters.
   2. Mil-F-51068 - Filters, Particulate (High-Efficiency Fire).
   3. Mil-F-51079 - Filter, Medium, Fire Resistant, High Efficiency.

E. National Fire Protection Association (NFPA)
   1. 70 - National Electrical Code
   2. 90A - Installation of Air Conditioning and Ventilating Systems.

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   1. Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems.

G. Underwriters Laboratories Inc. (UL)
   1. 555 - Fire Dampers.
   2. 723 - Test for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Shop Drawings
   1. Refer to Div. 1.

1.4 WARRANTY

A. Refer to Div. 1.

PART 2 PRODUCTS

2.1 DUCT SILENCERS

A. Construct duct silencers and sound attenuator banks entirely of galvanized steel in accordance with ASHRAE handbook, HVAC Systems and Equipment, Chapter 16 recommendations for high pressure rectangular ductwork, with seams lock formed. Do not use sound absorptive material of any kind in the duct silencers. Provide duct silencers which attenuate air/gas transmitted noise solely by virtue of controlled impedance membranes and broadly tuned resonators.

B. Provide duct silencers which will not fail structurally when subjected to a differential air pressure of 8 inches water gage inside to outside of casing.

C. Determine silencer ratings in a duct-to-reverberant room test facility which provides for airflow in both directions through the test silencer in accordance with ASTM E477. Arrange the test set-up and procedure so that all effects due to end reflection, directivity, flanking transmission, standing waves and test chamber sound absorption are eliminated. Provide acoustic ratings that include Dynamic Insertion Loss (DIL) and Self-Noise (SN) power levels both for forward flow (air and noise traveling in same direction) and reverse flow (air and noise traveling in opposite directions). Present data for tests conducted using silencers no smaller than 24"W x 24"H or 30"W x 24"H.

D. Provide silencers whose static pressure loss does not exceed those listed in the silencer schedule as the airflow indicates. Make airflow measurements in accordance with ASTM E477 and applicable portions of ASME, AMCA, and ADC airflow test codes. Report tests on the identical units for which acoustic data is presented.

E. With submittals, supply certified test data on Dynamic Insertion Loses, Self-Noise power Levels, and Aerodynamic Performance for Reverse and Forward Flow test conditions. Provide test data for a standard product. Conduct all rating tests in the same facility, utilize the same silencer, and have facility open to inspection upon request from the Architect.

F. Manufacturers: Industrial Acoustics Co., Inc.; Vibro-Acoustics; or Semco.

2.2 TURNING VANES

A. Provide square elbows indicated, with double curve type turning vanes fabricated from not less than No. 24 gage galvanized steel and designed to produce air turning friction not greater than that obtained from radius elbows having a throat radius equal to the duct width.

B. Secure turning vanes into assembled positions on runner strips and permanently weld or rivet them into the enclosing elbow.

C. Provide an entire assembly which is free of noise and vibration when in use.

D. Equal to high efficiency profile type as manufactured by the Aero/Dyne Co. or Hart & Cooley (Tuttle & Bailey) double blade Ducturns

2.3 DAMPERS

A. Manually Operated Volume Control Dampers.

1. General
   a. Provide manually operated volume control dampers at all branch connections of all duct systems.
   b. Splitter type when the branch duct size is equal to the dimension of the connecting face of the trunk duct, except maximum hinge dimension of a splitter damper shall be 24 inches.
   c. Single or multiple blade type when the branch duct size is less than the dimension of the connecting face of the trunk duct and whenever the branch duct is of a size where the hinge dimension is in excess of 24 inches.
   d. For round dampers of all sizes, provide butterfly type.
   e. Vent Products Co, Inc., dampers and accessories specified or equal product of Ruskin, American Warming and Ventilating, or Air Balance.
   f. Damper hardware, accessories and specialties: "Ventlok" as manufactured by Ventfabrics, Inc.
2. Splitter dampers
   a. Fabricate splitter dampers of the same gage and material as the duct, of double thickness to stream lined shape. Secure damper blade with a continuous piano hinge. Operate splitter dampers from the tip of the blade.
   b. For dampers in ducts requiring tip blade control rods 12 inches long and less, provide damper control consisting of a Ventlok 600-3 splitter damper control package with a No. 600 damper blade bracket and a No. 603 ball-joint control bracket with the proper length of 1/4-inch push rod.
   c. For dampers in ducts requiring blade tip control rods in excess of 12 inches in length, provide damper control consisting of a Ventlok No. 690 self-locking splitter damper control assembly with a damper blade bracket with a threaded casting and a self-locking handle operated control bracket with hexagonal acorn nut and proper length of zinc-plated, 3/8-inch threaded rod.
3. Single blade rectangular volume dampers
   a. Construct single blade rectangular volume dampers up to 20 inches long x 12 inches wide of 22 gage galvanized sheet with "V" reinforced edges.
   b. Single blade rectangular volume dampers 21 inches long x 12 inches wide to 48 inches long x 12 inches wide of 16 gage galvanized sheet with "V" reinforced edges.
   c. Regulators for single blade rectangular dampers up to 12 inches long x 12 inches wide:
      (1) For un-insulated ductwork:
          Ventlok No. 620 - 1/4-inch dial
          Ventlok No. 635 - 1/4-inch shank square end bearing
          Ventlok No. 635 - Retractable spring end bearing
      (2) For insulated ductwork:
          Ventlok No. 628 - Elevated 1/4-inch dial
          Ventlok No. 628 - 1/4-inch shank square end bearing
          Ventlok no. 626 - Long pin retractable spring end bearing
   d. Regulators for single blade rectangular dampers from 13 inches long x 12 inches wide to 20 inches long x 12-inches wide:
      (1) For un-insulated ductwork:
          Ventlok No. 635 - 3/8-inch dial
          Ventlok No. 635 - 3/8-inch shank square end bearing
          Ventlok No. 635 - Spring retractable spring end bearing
      (2) For insulated ductwork:

Ventlok No. 638 - Elevated 3/8-inch dial
Ventlok No. 638 - 3/8-inch long shank square end bearing
Ventlok no. 636 - Long pin spring retractable end bearing

e. Construct single blade rectangular volume dampers from 21 inches long x 12 inches wide to 48 inches long x 12 inches wide of 16 gage galvanized sheet with "V" reinforced centers and edges.

f. Regulators for single blade rectangular volume dampers from 21 inches long x 12 inches wide to 48 inches long x 12 inches wide:

(1) For un-insulated ductwork:
Ventlok No. 641 - 1/2-inch dial
Ventlok No. 635 - 1/2-inch shank square end bearing
Ventlok No. 635 - Retractable spring end bearing

(2) For insulated ductwork:
Ventlok No. 644 - Elevated 1/2-inch dial
Ventlok No. 638 - 1/2-inch long shank square and bearing
Ventlok no. 636 - Long pin spring retractable end bearing

4. Multiple blade rectangular volume control dampers.

a. Construct multiple blade rectangular volume control dampers of galvanized steel with 14 gage frames, 16 gage blades "V" reinforced at edges and centers, 1/2-inch diameter self-lubricating bronze bearings, 1/2-inch diameter axles and 1/2-inch diameter control rods. Ventlok No. 5103.

b. Provide regulators for multiple blade rectangular volume control dampers consisting of one set of Ventlok No. 4000 parallel blade damper hardware per blade, with the following:

(1) 1 - No. 401-16 gage galvanized center bracket with brass pivot pin and 1/4-inch x 20 square head set screw.

(2) 2 - No. 402 - 1/2-inch round, galvanized bearing pins, 2-1/2 inches long.

(3) *2 - No. 403 - 3/16-inch galvanized bearing straps with 1/4-inch x 20 square head set* screws.

(4) 2 - No. 404 - 5/8-inch o.d., self lubricating bronze bushings to fit over the 1/2-inch-diameter pins.

5. Round volume control dampers.

a. Fabricate round volume control dampers of the same material as the duct and shall be 20 gage up to 14-inch diameter and 16 gage larger than 14-inch diameter.

b. For round volume control dampers, provide Ventlok No. 810 regulator set consisting of the following:

(1) 1 - No. 801 retractable end bearing.
(2) 1 - No. 802 washer
(3) 1 - No. 803 handle
(4) 1 - No. 804 wing nut
(5) 1 - No. 805 damper tip

6. Exposed Damper Regulators

a. Wherever dampers occur above ceilings without removable tile and an access panel is not furnished, provide an exposed damper regulator to allow damper adjustment from below the ceiling.

b. Equal to Ventlok No. 666 in 1/2-inch or 3/8-inch size.

B. Pressure Relief Dampers.

1. Provide where shown on the Drawings, counterweighted, pressure relief dampers, consisting of 12 gage galvanized steel frame with 2-inch X 1/2-inch channel sides and 2-inch flat top and bottom. Blades: 0.024-inch aluminum with neoprene sealed edges. connected with 0.125-inch aluminum, die formed linkage brackets riveted to each blade, designed to ride on bronze bearings, and fitted with top and bottom stops.
2. Provide dampers with a field adjustable counterweight set as shown on the Drawings.
3. Air Balance Inc. Series BDC; Vent Products Co., Inc.; American Warming & Ventilating; or Ruskin.

C. Fire Dampers
   1. General
      a. Provide fire dampers at the locations and of the sizes and quantities as shown or scheduled.
      b. Provide fire dampers in accordance with NFPA 90A and UL 555.
      c. Provide the UL listing mark or classification marking and be installed as tested at the UL laboratory.
      d. Curtain type with damper blades out of air stream. Single or multi-blade fire dampers with blades in the air stream will not be accepted, except at duct air velocities less than 500 feet per minute and when noted on the drawings.
      e. For fire dampers for duct velocities exceeding 2400 feet per minute blades, side rails and stops and framing out of the air stream.
      f. Installation shall comply with the SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems and with the manufacturer's published installation instructions.
   2. Manufacturers
      a. Wall and floor mounted fire dampers: Air Balance, Inc., Type B or Type C, American Warming & Ventilating, Ruskin, or United McGill Corp.
      b. Ceiling mounted dampers: Ruskin Model CFD or CFDR; American Warming & Ventilating; Vent Products Co., Inc.; or Air Balance.

D. Combination Fire/Smoke Dampers
   1. General
      a. Provide combination fire/smoke dampers at the locations and of the sizes shown or scheduled.
      b. Provide dampers in accordance with NFPA 90A and UL555S, rated for 1-1/2 hour, Class II.
      c. Provide the Ul listing mark or classification marking and be installed as tester at the UL laboratory.
      d. Parallel blade type damper mounted in a damper frame and sleeve with fuseable link and negator spring, auxiliary operating jack shaft with fuseable rod and 120V electric operator.
      e. Sleeve gage thickness shall be minimum one gage thickness heavier than ductwork gage when used with breakaway connectors. Sleeve gage thickness shall be minimum 16 gage when used with rigid connections.
      f. Damper and operator provided and installed under this section, wired under Division 26.
      g. Installation shall comply with the SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems and with the manufacturer's published installation instructions.
   2. Manufacturers
      a. Rectangular and round combination fire/smoke dampers; Ruskin FSD35 (Rect.) or RSDR25 (Round), or as approved.

2.4 DUCT FLEXIBLE CONNECTIONS

A. General
1. Provide flexible connections between fan openings and sheet metal work and in ductwork at building expansion joints. No asbestos material will be permitted.

B. For Conventional Systems
1. Fabricate the flexible connections of 30 ounce per square yard neoprene coated glass fabric; similar to "Ventglas" as manufactured by Ventfabrics, Inc., or as approved.

C. For Kitchen Range Hood Exhaust Systems
1. Fabricate the flexible connections of 50 ounce per square yard wire inserted glass cloth as manufactured by Ventfabrics, Inc. and the fabric specified above.

2.5 GRILLES, REGISTERS AND DIFFUSERS

A. General
1. Provide grilles, registers and diffusers of sizes, types and capacities noise criteria (NC ratings), pressure drops, neck sizes, etc., as shown and specified.
2. Construction: steel or aluminum, as specified, as manufactured by Titus, Krueger, Price, Hart & Cooley (Tuttle & Bailey), or as approved.
3. Coordinate grilles, registers and diffusers with architectural ceiling plans and edge style with type of ceiling in which installed.
4. Do not use ceiling panels to support air outlets. Be responsible for properly supporting grilles, registers and diffusers.
5. Blank-off inactive lengths of linear diffusers with galvanized sheet metal, painted a dull black finish.

B. Supply Air Diffusers
1. See schedule on drawings.

PART 3 EXECUTION

3.1 DAMPERS

A. Automatic and Smoke Control Damper Installation.
1. Install in the ductwork where shown the automatic control dampers.

B. Fire Dampers and Combinatin Fire/Smoke Dampers
1. Install fire dampers in a sleeve extending at least two inches but not more than six inches each side of wall, floor or partition opening. Install fire dampers within the surfaces of the wall, shaft, partition or floor. Where physical obstructions prevent the installation of the fire damper within the surfaces, provide a 10 gage sleeve continuous through the opening for walls and an extended curb for floors.
2. Provide the clearance between the top and sides of the sleeve and opening at 1/8 inch per lineal foot of duct width for top clearance and 1/8 inch per lineal foot of duct height for side clearances. Increase size of mounting angles to provide a minimum of 1 inch overlap on wall or floor.
3. Provide sleeve gage and size of mounting angles the same as tested at the UL laboratory. Attach mounting angles to the sleeve only. Fasten retaining angles to the metal sleeve as tested or use a minimum of 1/4 - 20 x 1/2 round head stove bolts or one inch welds, on 6-inch centers, and no more than 2-3/4 inches from each corner.

3.2 FLEXIBLE DUCT CONNECTIONS INSTALLATION

A. Install flexible connections with sufficient slack to prevent transmission of vibration.

B. Secure circular connections to fans and sheet metal with 12 gage, 1-inch wide metal bands. Secure rectangular connections to fans and sheet metal with 1-inch x 1/8-inch flat bars fastened with screws or bolts at 8-inch intervals or slip joints similar to those specified for duct joints.

C. Tightly crimp the fabric into the slip joint and fasten the complete joint with sheet metal screws at maximum 8-inch intervals. Provide metal for fastening collars the same as specified for ductwork and bracing.

D. For kitchen range hood exhaust systems, provide two layers of wire inserted glass cloth and cover with one layer of the neoprene-coated glass fabric.

END OF SECTION

ELECTRICAL PROJECT SPECIFICATIONS

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SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Drawings and Data:

1. Electrical drawings are generally diagrammatic and location of outlets and equipment is approximate; exact routing of raceways, locations of outlets and equipment shall be governed by structural conditions and obstructions. This is not to be construed to permit system redesign. All outlets and equipment shall be interconnected as the Contract Documents indicate. Any relocation of outlets or equipment must be approved by the Architect.

2. Include minor details not usually shown or specified, but necessary for proper installation and operation of a system or piece of equipment in work.

1.2 SUMMARY

A. This Section includes the following electrical materials and methods:

1. Building wire, connectors, and splices for branch circuits and feeders.
2. Supporting devices for electrical components.
3. Concrete equipment bases.
4. Electrical identification.
5. Cutting and patching for electrical construction.
6. Touchup painting.

B. Related sections: The following Sections contain requirements that relate to this Section:

1. Division 26 Section “Low Voltage Electric Power Conductors and Cables”.
2. Division 26 Section “Identification for Electrical Systems”.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data for each type of product specified.

C. Shop Drawings detailing fabrication and installation of supports and anchorage for electrical items.

D. Coordination Drawings for electrical installation.

1. Prepare Coordination Drawings according to Division 01 Section “Submittals” to a ¼-inch-equals-1-foot (1:50) scale or larger. Detail major elements, components, and systems of electrical equipment and materials in relation to each other and to other systems, installations, and building components. Indicate

locations and space requirements for installation, access, and working clearance. Show where sequence and coordination of installations are important to the efficient flow of the Work. Coordinate drawing preparation with effort specified in other Specification Sections. Include the following:

a. Provisions for scheduling, sequencing, moving, and positioning large equipment in the building during construction.

b. Floor plans, elevations, and details, including the following:

1) Clearances to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
2) Equipment support details.
3) Exterior wall, roof, and foundation penetrations of cable and raceway; and their relation to other penetrations and installations.
4) Fire-rated interior wall and floor penetrations by electrical installations.
5) Sizes and locations of required concrete pads and bases.

c. Reflected ceiling plans to coordinate and integrate installing air outlets and inlets, light fixtures, alarm and communication systems components, sprinklers, and other ceiling-mounted items.

E. Samples of color, lettering style, and other graphic representation required for each identification product for Project.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms “Listed and Labeled”: As defined in the National Electrical Code, Article 100.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate electrical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.

E. Coordinate connecting electrical service to components furnished under other Sections.

F. Coordinate connecting electrical systems with exterior underground services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Provide two (2) sets of complete construction drawings to power and telephone area representatives within one week of contract award.

H. Contract includes all utility charges, labor and materials. If information is not available at bidding time, clearly state what is excluded and/or what allowance has been included.

I. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.

J. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

PART 2 – PRODUCTS

2.1 SUPPORTING DEVICES

A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.

1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.

2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.

B. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Fittings and accessories mate and match with channels and are from the same manufacturer.

C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or “click”-type hangers.

D. Sheet-Metal Sleeves: 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

I. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 CONCRETE EQUIPMENT BASES

A. Forms and Reinforcing Materials: As specified in Division 03 Section “Cast-in-Place Concrete”.

B. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified in Division 03 Section “Cast-in-Place Concrete”.

2.3 TOUCHUP PAINT

A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.

B. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.

C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 – EXECUTION

3.1 EQUIPMENT INSTALLATION REQUIREMENTS

A. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.

B. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Give right of way to raceways and piping systems installed at a required slope.

E. Install access doors and panels to provide access to electrical materials and equipment.

3.2 ELECTRICAL SUPPORTING METHODS

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Conform to manufacturer’s recommendations for selecting supports.

E. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; 200-lb-(90-kg-) minimum design load.

3.3 INSTALLATION

A. Install wires in raceway according to manufacturer's written instructions and NECA's "Standard of Installation".

B. Conductor Splices: Keep to the minimum and comply with the following:

1. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

2. Use splice and tap connectors that are compatible with conductor material.

C. Wiring at Outlets: Install with at least 12 inches (300 mm) of slack conductor at each outlet.

D. Connect outlets and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

E. Install devices to securely and permanently fasten and support electrical components.

F. Raceway Supports: Comply with NFPA 70 and the following requirements:

1. Conform to manufacturer's recommendations for selecting and installing supports.

2. Install individual and multiple raceway hangers and riser clamps to support raceways from building structure and not from suspended ceiling support wires. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.

a. Raceway directly associated with fixtures or equipment located on the suspended ceiling, and conduits not larger than ¾" trade size serving outlets within the room under the suspended ceiling wire.

b. Support no more than two (2) conduits from the same suspended ceiling wire. Install conduits minimum of two feet above ceiling so as not to limit accessibility.

3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

4. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.

5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.

6. Hanger Rods: ¼-inch (6-mm) diameter or larger threaded steel, except as otherwise indicated.

7. Spring Steel Fasteners: Specifically designed for supporting single conduits or tubing may be used in lieu of malleable iron hangers for 1-1/2-inch (38-mm) and

smaller raceways serving lighting and receptacle branch circuits within the same area, above suspended ceilings and for fastening raceways to channel and slotted angle supports.

8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.

9. Do not support raceways from ceiling grids.

G. Vertical Conductor Supports: Install simultaneously with conductors.

H. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.

I. In open overhead spaces, cast boxes threaded to raceways need not be separately supported, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

J. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

K. Firestopping: Apply to cable and raceway penetrations of fire-rated floor and wall assemblies. Perform firestopping as specified in Division 07 Section “Firestopping” to reestablish the original fire-resistance rating of the assembly at the penetration.

L. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:

1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.

2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.

3. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.

4. In partitions of light steel construction use sheet-metal screws.

5. Drill holes in concrete beams so holes more than 1-1/2 inches (38 mm) deep do not cut main reinforcing bars.

6. Drill holes in concrete so holes more than ¾ inch (19 mm) deep do not cut main reinforcing bars.

7. Fill and seal holes drilled in concrete and not used.

8. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

M. Install concrete pads and bases according to requirements of Division 03 Section “Cast-in-Place Concrete”.

N. Install utility-metering equipment according to utility company’s written requirements. Provide grounding and empty conduits as required by company.

3.4 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.5 TOUCHUP PAINTING

A. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.

B. Follow paint manufacturer’s written instructions for surface preparation and for timing and application of successive coats.

END OF SECTION 26 05 00

SECTION 26 05 19

LOW VOLTAGE ELECTRIC POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated splices, connectors, and terminations for wiring systems rated 600 volts and less.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Field test reports indicating and interpreting test results relative to compliance with performance requirements of testing standard.

1.4 QUALITY ASSURANCE

A. Testing Firm Qualifications: In addition to the requirements specified in Division 01 Section “Quality Control Services”, an independent testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full member company of the International Electrical Testing Association (NETA).

1. Testing Firm’s Field Supervisor Qualifications: A person currently certified by the NETA National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Comply with NFPA 70 “National Electrical Code” for components and installation.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms “Listed and Labeled”: As defined in the “National Electrical Code”, Article 100.

1.5 SEQUENCING AND SCHEDULING

A. Coordination: Coordinate layout and installation of cable with other installations.

1. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire and cable according to NEMA WC-26.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

1. Wires and Cables:

a. American Insulated Wire Corporation, Leviton Manufacturing Co.
b. Brand-Rex Cable Systems, Brintec Corp.
c. Carol Cable Company, Inc.
d. Senator Wire & Cable Co.
e. Southwire Co.

2. Connectors for Wires and Cables:

a. AFC, Monogram Co.
b. AMP, Inc.
c. Anderson, Square D Co.
d. Electrical Products Division , 3M Co.
e. O-Z/Gedney Unit, General Signal.

2.2 BUILDING WIRES AND CABLES

A. UL-Listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 “Applications” Article.

B. Rubber Insulation: Conform to NEMA WC 3.

C. Thermoplastic Insulation: Conform to NEMA WC 5.

D. Cross-Linked Polyethylene Insulation: Conform to NEMA WC 7.

E. Ethylene Propylene Rubber Insulation: Conform to NEMA WC 8.

F. Stranded conductor for larger than 12 AWG.

2.3 CONNECTORS AND SPLICES

A. UL-Listed factory-fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated. Select to comply with Project’s installation requirements and as specified in Part 3 “Applications” Article.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Service Entrance: Type THWN-2, copper conductor, in raceway.

B. Feeders: Type THHN/THWN, copper conductor, in raceway.

C. Branch Circuits: Type THHN/THWN, copper conductor, in raceway.

D. Class 1 Control Circuits: Type THHN/THWN, copper conductor, in raceway.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and the NECA "Standard of Installation".

B. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.

1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.

2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

C. Install exposed cable, parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.

D. Conductor Splices: Keep to minimum.

1. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

2. Use splice and tap connectors that are compatible with conductor material.

E. Wiring at Outlets: Install with at least 12 inches of slack conductor at each outlet.

F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

G. Install cables within handholes, underground pull box by routing around the perimeter of the box, support cables with integral inserts.

3.4 FIELD QUALITY CONTROL

A. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Standard ATS, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning products at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Requirements of the following Division 26 Sections apply to this Section:

1. "Common Work Results for Electrical".

1.2 SUMMARY

A. This Section includes solid grounding of electrical systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other sections of these Specifications.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems".

2. Division 26 Section "Low Voltage Electrical Power Conductors and Cables".

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product data for ground rods, connectors and connection materials, and grounding fittings.

C. Field-testing organization certificate, signed by the Contractor, certifying that the organization performing field tests complies with the requirements specified in Quality Assurance below.

D. Report of field tests and observations certified by the testing organization.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

B. Field-Testing Organization Qualifications: To qualify for acceptance, the independent testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.

C. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code" (NEC).

D. UL Standard: Comply with UL 467, “Grounding and Bonding Equipment”.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Anixter Bros., Inc.
2. Buckingham Mfg. Co.
3. A.B. Chance Co.
4. Dossert Corp.
5. Erico Products, Inc.
6. Ideal Industries, Inc.
7. Kearney-National.
8. McGill Mfg.
9. O-Z/Gedney Co.
10. Raco, Inc.
11. Thomas & Betts Corp.
12. Utilco Co.

2.2 GROUNDING AND BONDING PRODUCTS

A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

B. Conductor Materials: Copper.

2.3 WIRE AND CABLE CONDUCTORS

A. General: Comply with Division 26 Section “Common Work Results for Electrical”. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

B. Equipment Grounding Conductor: Green insulated.

C. Grounding Electrode Conductor: Stranded cable.

D. Bare Copper Conductors: Conform to the following:

1. Solid Conductors: ASTM B-3.
2. Assembly of Stranded Conductors: ASTM B-8.
3. Tinned Conductors: ASTM B-33.

2.4 MISCELLANEOUS CONDUCTORS

A. Ground Bus: Bare annealed copper bars of rectangular cross section.

B. Braided Bonding Jumpers: Copper tape, braided No. 30 gauge bare copper wire, terminated with copper ferrules.

C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inches thick and 2 inches wide, except as indicated.

2.5 CONNECTOR PRODUCTS

A. General: Listed and labeled as grounding connectors for the materials used.

B. Pressure Connectors: High-conductivity-plated units.

C. Bolted Clamps: Heavy-duty units listed for the application.

D. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

2.6 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten welded to core.

1. Size: ¾ inch dia. by 10 feet long.

PART 3 – EXECUTION

3.1 APPLICATION

A. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.

1. Install separate insulated equipment grounding conductors with all circuit conductors.

B. Underground Conductors: Insulated, stranded copper except as otherwise indicated.

C. Signal and Communications: For telephone, alarm, and communication systems, provide a #4 AWG minimum green insulated copper conductor in raceway from the grounding electrode system to each terminal cabinet or central equipment location.

D. Separately derived systems required by NEC to be grounded shall be grounded in accordance with NEC 2002 Article 250-30.

E. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to a grounding electrode as indicated in addition to separate equipment grounding conductor run with supply branch circuit.

3.2 INSTALLATION

A. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.

B. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Use

¾-inch by 10-ft. ground rods except as otherwise indicated. Drive rods until tops are 6 inches below finished floor or final grade except as otherwise indicated.

C. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

D. Bond interior metal piping systems and metal air ducts to equipment ground conductors of pumps, fans, electric heaters, and air cleaners serving individual systems.

E. UFER Ground: Fabricate with 20 feet of conductor laid lengthwise in excavation for foundation or footings. Install so conductor is within 2 inches of the bottom of the concrete. Where base of foundation is less than 20 feet in length, coil excess conductor at base of foundation. Bond conductor to reinforcing steel at four locations, minimum. Extend conductor below grade and connect to building grounding grid or grounding electrode.

3.3 CONNECTIONS

A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.

2. Make connections with clean bare metal at points of contact.

3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.

4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.

B. Exothermic Welded Connections: Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indication improper cleaning are not acceptable.

C. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.

D. Terminate feeder conduits and conduits which penetrate concentric ring knockouts at panelboards with grounding bushings. Grounding bushings shall be connected to panelboard ground bus with an insulated stranded copper ground wire.

E. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and

bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.

F. Compression-Type Connections: Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.

G. Moisture Protection: Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

3.4 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Handholes: Install a ¾-inch by 10-ft. driven ground rod close to the wall and set the rod depth such that 4 inches will extend above the finished floor. Where necessary, install ground rod before the handhole is placed and provide a No. 1/0 bare tinned-copper conductor from the ground rod into the handhole through a waterproof sleeve in the handhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below the concrete. Seal floor opening with waterproof nonshrink grout.

B. Connections at Handholes: Connect exposed metal parts, such as inserts, cable racks, pulling irons, and cable shields within each handhole to the ground rod or ground conductor. Make connections with minimum No. 4 AWG stranded hard-drawn copper wire. Train connectors plumb or level around corners and fasten to handhole walls. Connect to cable armor and cable shields by means of tinned terminals soldered to the armor or shield, or as recommended by manufacturer of splicing and termination kits.

C. Grounding System: Ground non-current-carrying metallic items associated with handholes and pad-mounted equipment by connecting them to bare underground cable and grounding electrodes arranged as indicated.

3.5 FIELD QUALITY CONTROL

A. Independent Testing Organization: Arrange and pay for the services of a qualified independent electrical testing organization to perform tests described below.

B. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System".

C. Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are directed that exceed those indicated the provisions of the Contract, covering changes will apply.

END OF SECTION 26 05 26

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Raceways include the following:

1. Rigid metal conduit.
2. Intermediate metal conduit.
3. Electrical metallic tubing (EMT).
4. Flexible metal conduit.
5. Liquidtight flexible metal conduit.
6. Rigid nonmetallic conduit.
7. Wireway.
8. Surface raceways.

C. Boxes, enclosures, and cabinets include the following:

1. Device boxes.
2. Floor boxes.
3. Outlet boxes.
4. Pull and junction boxes.
5. Cabinets and hinged cover enclosures.

D. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 26 Section “Identification for Electrical Systems”.

2. Division 26 Section “Underground Ducts and Raceways for Electrical Systems”.

3. Division 26 Section “Wiring Devices” for devices installed in boxes and floor box service fittings.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product data for surface raceway, wireway and fittings, floor boxes, hinged cover enclosures, and cabinets.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 “National Electrical Code” for components and installation.

B. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.

C. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.

D. Comply with NECA “Standard of Installation”.

E. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

F. Coordinate with other Work, including metal and concrete deck installation, as necessary to interface installation of electrical raceways and components with other Work.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Metal Conduit and Tubing:

   a. Allied Tube and Conduit, Grinnell Co.
   b. Anixter Brothers, Inc.
   c. Flexcon , Inc., Coleman Cable Systems, Inc.
   d. Spiraduct, Inc.
   e. Triangle PWC, Inc.
   f. Wheatland Tube Co.

2. Nonmetallic Tubing and Conduit:

   a. Anamet, Inc., Anaconda Metal Hose.
   b. Carlon.
   c. Certainteed Corp, Pipe & Plastics Group.
   d. Condux International, Electrical Products.
   e. Thomas & Betts Corp.

3. Conduit Bodies and Fittings:

   a. American Electric, Construction Materials Group.
   b. Emerson Electric Co., Appleton Electric Co.
   c. Carlon.
   d. Hubbell, Inc., Killark Electric Manufacturing Co.
   e. General Signal, O-Z/Gedney Unit.
   f. Spring City Electrical Manufacturing Co.

4. Wireway:

   a. Hoffman Engineering Co.
   b. Keystone/Rees, Inc.
   c. Square D Co.

5. Surface Metal Raceway:

   a. Butler Manufacturing Co., Walker Division.
   b. The Wiremold Co., Electrical Sales Division.

6. Boxes, Enclosures, and Cabinets:

   a. Butler Manufacturing Co., Walker Division.
   b. Cooper Industries, Midwest Electric.
   c. Erickson Electrical Equipment Co.
   d. American Electric, FL Industries.
   e. Hoffman Engineering Co., Federal-Hoffman, Inc.
   f. Hubbell Inc., Killark Electric Manufacturing Co.
   g. General Signal, O-Z/Gedney.
   h. Raco, Inc., Hubbell Inc.
   i. Robroy Industries, Inc., Electrical Division.
   j. Spring City Electrical Manufacturing Co.
   k. Square D Co.
   l. Thomas & Betts Corp.

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Intermediate Metal Conduit: ANSI C80.6

D. Electrical Metallic Tubing and Fittings: ANSI C80.3 with compression-type fittings.

E. Flexible Metal Conduit: Zinc-coated steel.

F. Liquidtight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.

G. Fittings: NEMA FB 1, compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT

A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2, Schedule 40 or 80 PVC.

B. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

2.4 WIREWAYS

A. Material: Sheet metal sized and shaped as indicated, without knockouts.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.

C. Select features where not otherwise indicated, as required to complete wiring system and to comply with NEC.

2.5 SURFACE RACEWAY

A. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceway.

B. Surface Metal Raceway: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating suitable for painting.

2.6 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

B. Cast Metal Boxes: NEMA FB 1, type FD, cast feralloy box with gasketed cover.

C. Minimum size 4 inch square by 2-1/8 inches deep.

2.7 FLOOR BOXES

A. Floor Box: Galvanized sheet steel, fully adjustable, rectangular.

1. Product: Steel City Series 664 with suitable cover.

2.8 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast Metal Boxes: NEMA FB 1, cast steel with gasketed cover.

C. Underground: Precast or concrete with traffic rated cover if in traffic area.

D. Minimum size 4 inch square by 2-1/8 inches deep.

2.9 CABINETS AND ENCLOSURES

A. Hinged Cover Enclosures: NEMA 250, steel enclosure with continuous hinge cover and flush latch. Finish inside and out with manufacturer's standard enamel.

B. Cabinets: NEMA 250, type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Outdoors: Use the following wiring methods:

1. Exposed: Rigid or intermediate metal conduit.

2. Concealed: Rigid or intermediate metal conduit.

3. Underground, Single Run: Rigid nonmetallic conduit.

4. Underground, Grouped: Rigid nonmetallic conduit.

5. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquidtight flexible metal conduit.

6. Boxes and Enclosures: NEMA Type 3R or Type 4.

B. Indoors: Use the following wiring methods:

1. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use liquidtight flexible metal conduit.

2. Damp or Wet Locations: Rigid steel conduit.

3. Exposed: Rigid or intermediate metal conduit up to 8' A.F.F. Electrical metallic tubing above 8'.

4. Concealed: Electrical metallic tubing.

5. Boxes and Enclosures: NEMA Type 1, except in damp or wet locations use NEMA Type 4, stainless steel.

6. Concealed in concrete or masonry walls: Rigid steel conduit or rigid non-metallic conduit.

3.3 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Install a separate ground wire in all raceways.

C. Minimum conduit size: ¾ inch.

D. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

E. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

F. Install raceways level and square and at proper elevations. Provide adequate headroom.

G. Complete raceway installation before starting conductor installation.

H. Support raceway as specified in Division 26 Section "Common Work Results for Electrical".

I. Use temporary closures to prevent foreign matter from entering raceway.

J. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

K. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.

L. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, except as otherwise indicated.

M. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated.

N. Raceways Embedded in Slabs: Install in middle third of the slab thickness where practical, and leave at least 1 inch (25 mm) concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in the concrete.

3. Run conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. When at right angles to reinforcement, place conduit close to slab support.

4. Transition nonmetallic conduit to rigid steel conduit, or IMC before rising above floor.

O. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.

2. Make bends in parallel or banked runs from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

3. Install expansion fittings in all raceways at building expansion joints.

P. Raceways under slabs and underground:

1. Curves and bends: Use rigid steel conduit half-lap wrapped with 20 mil corrosion protective tape.

2. Depth: Minimum 24 inches below finished grade.

3. Minimum size: 1 inch except for single floor outlets ¾ inch.

4. Transition non-metallic conduit to rigid steel before rising above grade on floor.

5. Protect conduit with half-lap wrapping with corrosion protective tape for 3 inches minimum both sides of transition point.

Q. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.

2. Use insulating bushings to protect conductors.

R. Set screw fittings not permitted.

S. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely, and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.

T. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.

U. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb (90 kg) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull wire.

V. Telephone and Signal System Raceways 2-Inch Trade Size and Smaller: In addition to the above requirements, install in maximum lengths of 150 feet (45 m) and with a maximum of two 90-deg bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.

W. Install raceway sealing fittings according to the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

1. Where conduits enter or leave hazardous locations.

2. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.

3. Where otherwise required by the NEC.

X. Stub-Up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs, and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches (150 mm) above the floor. Where equipment connections are not made under this Contract, install screwdriver-operated threaded flush plugs flush with floor.

Y. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors and transformers. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

Z. Surface Metal Raceway: Install a separate green ground conductor in raceway from the junction box supplying the raceway to receptacle.

AA. Set floor boxes level and adjust to floor surface.

BB. Install hinged cover enclosures and cabinets plumb. Support at each corner.

CC. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

Full height demountable partitions: Serve from above ceiling with flexible conduit within the partition.

DD. Outlet and Device Boxes:

1. Flush mount with plaster rings in all finished areas.
2. Offset all boxes that are back to back in the same wall.
3. Coordinate location of boxes above counter splashes and built-ins.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by the manufacturer.

3.5 CLEANING

A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 26 05 33

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes underground conduits and ducts, duct banks, pull boxes and handholes, manholes, and other underground utility structures.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 26 Section “Identification of Electrical Systems”.

1.3 DEFINITIONS

A. Duct: Electrical conduit and other raceway, either metallic or nonmetallic, used underground, embedded in earth or conrete.

B. Duct Bank: 2 or more conduits or other raceway installed underground in the same trench or concrete envelope.

C. Handhole or pullbox: An underground junction box in a duct or duct bank.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 01 Specification Sections.

B. Product data for metal accessories for handholes, conduit and duct, duct bank materials, and miscellaneous components.

C. Shop drawings showing details and design calculations for precast handholes, including reinforcing steel. Stamp drawings with seal of registered professional structural engineer.

D. Certificate for concrete and steel used in underground precast concrete utility structures, according to ASTM C 858.

E. Inspection report for factory inspections, according to ASTM C 1037.

F. Coordination drawings showing duct profiles and coordination with other utilities and underground structures. Include plans and sections drawn to accurate scale.

G. Record Documents: Show dimensioned locations of underground ducts, and handholes.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in manufacturing underground precast concrete utility structures of types and sizes required and similar to those indicated for this Project. Firm must have a record of successful in-service performance.

B. Comply with NFPA 70 “National Electrical Code” and ANSI C2 “National Electrical Safety Code” for components and installation.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms “Listed” and “Labeled”: As defined in the “National Electrical Code”, Article 100.

D. Coordinate layout and installation of ducts and handholes with final arrangement of other utilities as determined in the field.

E. Coordinate elevations of duct and duct bank entrances into handholes with final profiles of conduits as determined by coordination with other utilities and underground obstructions. Revise locations and elevations from those indicated as required to suit field conditions and ensure duct runs drain to handholes, and as approved by the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete units at site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide specified products by one of the following:

1. Underground Precast Concrete Utility Structures:

a. Precast Division; Carder Concrete Products.
b. Christy Concrete Products, Inc.
c. Utility Vault Co.
d. Wausau Concrete Co.

2. Frames and Covers:

a. Campbell Foundry Co.
b. East Jordan Iron Works, Inc.
c. McKinley Iron Works, Inc.
d. Neenah Foundry Co.

3. Nonmetallic Ducts:

a. Arnco Corp.
b. Carlon; Lamson & Sessions Company.
c. Pipe & Plastic Group; Certainteed Products Corp.

2.2 CONDUIT AND DUCT

A. Rigid Steel Conduit: ANSI C80.1, galvanized.

B. Rigid Plastic Conduit: NEMA TC 2, Schedule 40 PVC, rated for use with 90 deg C conductors under all installation conditions.

C. PVC Conduit and Tubing Fittings: NEMA TC 3.

D. Rigid Plastic Underground Conduit: UL 651A, Type A PVC.

E. Plastic Utilities Duct: NEMA TC 6.

F. Plastic Utilities Duct Fittings: NEMA TC 9; match to duct type and material.

G. Plastic Communication Duct and Fittings: NEMA TC 10.

H. Manufactured Bends: Metallic, not less than 36-inches radius.

2.3 PULL BOXES AND HANDHOLES

A. Cover Legend: ELECTRIC or SIGNAL.

2.4 PRECAST CONCRETE UNITS

A. Precast Units: Interlocking, mating sections, complete with accessory items, hardware, and features as indicated. Include concrete knockout panels for conduit entrance and sleeve for ground rod.

B. Design structure according to ASTM C 858.

C. Structural Design Loading: ASTM C 857, Class A-16.

D. Fabricate according to ASTM C 858.

E. Joint Sealant: Continuous extrusion of asphaltic butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand the maximum hydrostatic pressures at the installation location with the ground water level at grade.

F. Source Quality Control: Inspect structures according to ASTM C 1037.

2.5 ACCESSORIES

A. Duct Supports: Rigid PVC spacers selected to provide minimum duct spacings and concrete cover depths indicated, while supporting ducts during concreting.

B. Frames and Covers: Cast iron with cast-in legend ELECTRIC or SIGNAL as appropriate. Machine cover-to-frame bearing surfaces.

C. Pulling Eyes in Walls: Eyebolt with reinforcing bar fastening insert. 2-inches diameter eye, 1-inch by 4-inches bolt. Working load embedded in 6-inches 4000 psi concrete: 13,000 pounds minimum tension.

D. Pulling and Lifting Irons in Floor: 7/8-inches-diameter, hot-dipped galvanized, bent steel rod, stress relieved after forming, and fastened to reinforced rod. Exposed triangular opening. Ultimate yield strength: 40,000 pounds shear and 60,000 pounds tension.

E. Bolting Inserts for Cable Stanchions: Flared, threaded inserts of noncorrosive, chemical resistant, nonconductive thermoplastic material; ½-inches internal diameter by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base. Tested ultimate pull-out strength: 12,000 pounds minimum.

F. Expansion Anchors for Installation After Concrete is Cast: Zinc-plated carbon steel wedge type with stainless-steel expander clip ½-inches bolt size, 5,300-pounds rated pull-out strength, and 6,800-pound rated shear strength minimum.

G. Cable Stanchions: Hot-rolled, hot-dipped galvanized "T" section steel, 2-1/4-inches size, punched with 14 holes on 1-1/2-inches centers for cable arm attachment.

H. Cable Arms: 3/16-inches thick hot-rolled, hot-dipped galvanized sheet steel pressed to channel shape, approximately two 12 inches wide by 14 inches long and arranged for secure mounting in horizontal position at any position on cable stanchions.

I. Cable Support Insulators: High glaze, wet-process porcelain arranged for mounting on cable arms.

J. Ground Rods: Solid copper clad steel, ¾-inches diameter by 10-feet length.

K. Ground Wire: Stranded bare copper, No. 6 AWG minimum.

L. Duct Stealing Compound: Nonhardening, safe for human skin contact, not deleterious to cable insulation, workable at temperatures as low as 35 deg F (1 deg C), withstands temperature of 300 deg F (149 deg C) without slump, and adheres to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and the common metals.

2.6 CONSTRUCTION MATERIALS

A. Brick: Conform to ASTM C 55, concrete brick Type 1, Grade N.

B. Mortar: Conform to ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. (60 L), where packaged mix complying with ASTM C 387, Type M may be used.

C. Concrete: Conform to Division 03 Section "Cast-In-Place Concrete" for concrete and reinforcing.

1. Strength: 3000 psi (20.7 MPa) minimum 28-day compressive strength.
2. Aggregate For Duct Encasement: 3/8-inches maximum size.

PART 3 – EXECUTION

3.1 APPLICATION

A. Underground Ducts For Electrical Utility Service: Direct buried plastic conduit.

B. Underground Ducts For Electrical Feeders: Plastic conduit encased in concrete.

C. Underground Ducts For Electrical Branch Circuits: Direct buried plastic conduit.

D. Underground Ducts For Telephone Utility Service: Direct buried plastic conduit.

E. Underground Ducts For Communication Circuits: Plastic underground conduit encased in concrete.

F. Handholes: Cast-in-place concrete.

3.2 EXAMINATION

A. Examine site to receive ducts and handholes for compliance with installation tolerances and other conditions affecting performance of the underground ducts and handholes. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 EARTHWORK

A. Restore surface features at areas disturbed by excavation, and reestablish original grades except as otherwise indicated. Replace removed sod as soon as possible after backfilling is completed. Restore all areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching.

B. Restore disturbed paving. Refer to “Cutting and Patching” in Division 01.

3.4 CONDUIT AND DUCT INSTALLATION

A. Install nonmetallic conduit and duct as indicated according to manufacturer’s written instructions.

B. Slope: Pitch ducts minimum of 4 inches per 100 feet (1:300) to drain toward handholes and away from buildings and equipment. Slope ducts from a high point in runs between 2 handholes to drain in both directions.

C. Curves and Bends: Use manufactured metallic elbows for stub-ups at equipment and at building entrances. Use long sweep bends with a minimum radius of 25 feet both horizontally and vertically at other locations.

D. Make joints in ducts and fittings watertight according to manufacturer’s instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.

E. Duct Entrances to Handholes: Space end bells approximately 10 inches on center for 5-inch ducts and varied proportionately for other duct sizes. Change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line. Grout end bells into handhole walls from both sides to provide watertight entrances.

F. Building Entrances: Transition from underground duct to conduit 10 feet minimum outside the building wall. Use fittings manufactured for the purpose. Follow appropriate installation instructions below.

1. Concrete-Encased Ducts: Install reinforcing in duct banks passing through disturbed earth near buildings and other excavations. Coordinate duct bank with structural design to support duct bank at wall without reducing structural or watertight integrity of building wall.

2. Direct-Buried, Nonencased Duct Entering Nonwaterproofed Walls: Install a Schedule 40 galvanized-steel pipe sleeve for each duct. Caulk space between conduit and sleeve with duct-sealing compound on both sides for moisture-tight seal.

G. Separation Between Direct-Buried, Nonencased Ducts: 3 inches minimum for like services, and 12 inches minimum between power and signal ducts.

H. Concrete-Encased Nonmetallic Ducts: Support on plastic separators coordinated with duct size and required duct spacing, and install according to the following:

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, and secure separators to the earth and to ducts to prevent floating during concreting. Do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

2. Concreting: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not use power-driven agitating equipment unless specifically designed for duct bank application. Pour each run of envelope between manholes or other terminations in one continuous operation. When more than one pour is necessary, terminate each pour in a vertical plane and install ¾-inches reinforcing rod dowels extending 18 inches into the concrete on both sides of joint near the corners of the envelope.

3. Reinforcing: Reinforce duct banks where they cross disturbed earth and where indicated.

4. Forms: Use the walls of the trench to form the side walls of the duct bank where the soil is self-supporting and concrete envelope can be poured without soil inclusions, otherwise, use forms.

5. Minimum Clearances Between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.

6. Depth: Except as otherwise indicated, install top of duct bank at least 24 inches below finished grade in nontraffic areas and at least 30 inches below finished grade in vehicular traffic areas.

I. Stub-Ups: Use rigid steel conduit for stub-ups to equipment. For equipment mounted on outdoor concrete pads, extend steel conduit a minimum of 5 feet from edge of pad. Install insulated grounding bushings on the terminations. Couple steel conduits to the ducts with adapters designed for the purpose and then encase coupling with 3 inches of concrete.

J. Sealing: Provide temporary closure at terminations of ducts that are wired under this Project. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15 psi (1.03 MPa) hydrostatic pressure.

K. Pulling Cord: Install 100-pound-test nylon cord in ducts, including spares.

L. Galvanized rigid steel or intermediate metal conduit installed underfloor or underground shall be half-lap wrapped with corrosion protective tap or PVC coated at the factory.

3.5 UNDERGROUND UTILITY STRUCTURE INSTALLATION

A. Grounding: Install ground rod through floor in each structure with top protruding 4 inches (100 mm) above floor. Seal the floor opening against water penetration with waterproof nonshrink grout. Ground exposed metal components and hardware with bare copper ground conductor. Train conductors neatly around corners. Install on walls and roof using cable clamps secured with expansion anchors.

B. Precast Concrete Underground Structure Installation: Install as indicated, according to manufacturer's written instructions and ASTM C 891.

1. Install units plumb and level and with orientation and depth coordinated with arrangement of connecting ducts to minimize bends and deflections required for proper entrances.

2. Support units on a level bed of crushed stone or gravel, graded from the 1-inch sieve to the No.4 sieve and compacted to same density as adjacent undisturbed earth.

3.6 FIELD QUALITY CONTROL

A. Testing: Demonstrate capability and compliance with requirements upon completion of installation of underground duct and utility structures.

1. Grounding: Test handhole grounding to ensure electrical continuity of bonding and grounding connections. Measure ground resistance at each ground rod and report results. Use an instrument specifically designed for ground-resistance measurements.

2. Duct Integrity: Rod ducts with a mandrel ¼ inches smaller in diameter than internal diameter of ducts. Where rodding indicates obstructions in ducts, remove the obstructions and retest.

3. Water Tightness: Make internal inspection of manholes 3 months after completion of construction for indications of water ingress. Where leakage is noted, remove water and seal leak sources. Reinspect after 2 months and reseal remaining leak sources. Repeat process at 2 month intervals until leaks are corrected.

B. Correct installations where possible, and retest to demonstrate compliance. Otherwise, remove and replace defective products and retest.

3.7 CLEANING

A. Pull brush through full length of ducts. Use round bristle brush with a diameter ½ inches greater than internal diameter of duct.

B. Clean internal surfaces of manholes including sump. Remove foreign material.

END OF SECTION 26 05 43

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes identification of electrical materials, equipment, and installations.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data for each type of product specified.

C. Schedule of identification nomenclature to be used for identification signs and labels.

D. Samples for each color, lettering style, and other graphic representation required for identification materials; samples of labels and signs.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.

B. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements.

2.2 RACEWAY AND CABLE LABELS

A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Conform to ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway or cable size.

1. Color: Black legend on orange field.
2. Legend: Indicates voltage and service.

C. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.

D. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic bands sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

E. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 2 mils thick by 1 to 2 inches wide (0.08 mm thick by 25 to 51 mm wide).

F. Underground Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:

1. Size: Not less than 6 inches wide by 4 mils thick (152 mm wide by 0.102 mm thick).
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed Legend: Indicates type of underground line.

G. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

H. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inches- (0.4-mm-) thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

I. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange backgrounds, except as otherwise indicated, with eyelet for fastener.

J. Aluminum-Faced Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inches thick, laminated with moisture-resistant acrylic adhesive, and punched for the fastener. Preprinted legends suit each application.

K. Brass or Aluminum Tags: Metal tags with stamped legend, punched for fastener. Dimensions: 2 by 2 by 0.05 inches.

2.3 ENGRAVED NAMEPLATES AND SIGNS

A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Engraving stock, melamine plastic laminate, 1/16-inches minimum thick for signs up to 20 sq. in., 1/8 inches thick for larger sizes.

1. Engraved Legend: White letters on black face.
2. Punched for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched for fasteners, with colors, legend, and size as indicated or as otherwise required for the application. ¼-inches grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose acetate butyrate signs with 0.0396-inches, galvanized steel backing, with colors, legend, and size appropriate to the application. ¼-inches grommets in corners for mounting.

E. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties with the following features:

1. Minimum Width: 3/16 inches.
2. Tensile Strength: 50 lbs minimum.
3. Temperature Range: Minus 40 to 185 deg F.
4. Color: As indicated where used for color coding.

B. Paint: Alkyd-urethane enamel over primer as recommended by enamel manufacturer.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install identification devices according to manufacturer's written instructions.

B. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

C. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations used in the Contract Documents or required by codes and standards. Use consistent designations throughout the Project.

D. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

E. Self-Adhesive Identification Products: Clean surfaces of dust, lose material, and oily films, before applying.

F. Identify Raceways and Exposed Cables of Certain Systems with Color Banding: Band exposed and accessible raceways of the systems listed below for identification.

1. Bands: Pretensioned, snap-around, colored plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of 2-color markings in contact, side by side.

2. Locate bands at changes in directions, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25 feet in congested areas.

3. Colors: As follows:

a. Fire-Alarm System: Red.
b. Fire-Suppression Supervisory and Control System: Red and yellow.

c. Combined Fire-Alarm and Security System: Red and blue.
d. Security System: Blue and yellow.
e. Telecommunications System: Green and yellow.

G. Install Circuit Identification Labels on Boxes: Label externally as follows:

1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.

2. Concealed Boxes: Permanent marker, legibly denoted on cover.

3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

H. Identify Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communications lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope do not exceed an overall width of 16 inches, use a single line marker.

I. Color-Code Conductors: Secondary service, feeder, and branch circuit conductors throughout the secondary electrical system.

1. 208/120V System: As follows:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.
d. Neutral: White.
e. Ground: Green.

2. 480/277V System: As follows:

a. Phase A: Yellow.
b. Phase B: Brown.
c. Phase C: Orange.
d. Neutral: Gray.
e. Ground: Green.

3. Factory-apply color the entire length of the conductors, except the following field-applied, color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.

a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last 2 turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Adjust tape bands to avoid obscuring cable identification markings.

b. Colored cable ties applied in groups of 3 ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

J. Power Circuit Identification: Use metal tags or aluminum wraparound marker bands for cables, feeders, and power circuits in pull boxes, junction boxes and manholes.

1. Legend: ¼-inches-steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.

2. Fasten tags with nylon cable ties; fasten bands using integral ears.

K. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.

2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color coding for voltage and phase indication of secondary circuit.

3. Multiple Control and Communications Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color coding, or cable marking tape.

L. Apply warning, caution, and instruction signs and stencils as follows:

1. Install warning, caution, and instruction signs where indicated or required to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved, plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.

M. Install identification as follows:

1. Apply equipment identification labels of engraved plastic laminate on each major unit of equipment, including central or master unit of each system. This includes communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Except as otherwise indicated, provide a single line of text with ½-inches-high lettering on 1-1/2-inches-high label; where 2 lines of text are required, use lettering 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment.

a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Electrical switchgear and switchboards.
d. Motor starters.
e. Push-button stations.
f. Contactors.
g. Remote-controlled switches.
h. Dimmers.
i. Control devices.
j. Transformers.
k. Telephone switching equipment.
l. Clock/program master equipment.
m. Call system master station.
n. TV/audio monitoring master station.
o. Fire-alarm master station or control panel.
p. Security-monitoring master station or control panel.

2. Apply designation labels of engraved plastic laminate for disconnect switches, breakers, push buttons, pilot lights, and similar items for power distribution and control components above, except panelboards and alarm/signal components where labeling is specified elsewhere. For panelboards, provide framed, typed

circuit schedules with explicit description and identification of items controlled by each individual breaker.

END OF SECTION 26 05 53

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Requirements of the following Division 26 Sections apply to this section:

1. "Common Work Results for Electrical".
2. "Identification for Electrical Systems".

1.2 SUMMARY

A. This Section includes the following types of lighting controls:

1. Manual-type dimming systems.
2. Time switches.
3. Photoelectric relays.
4. Contactors.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 01 Specification Sections.

B. Product data for products specified in this Section. Include dimensions and data on features and components. Include wiring diagrams and elevation views of front panels of control and indicating devices. Include data on ratings. For flush control panels, submit color and finish options for selection.

C. Lists of ballast and lamp combinations compatible with dimmer systems, by manufacturer and catalog number.

D. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 01.

E. Record of field tests for tests specified in Part 3 of this Section.

F. Sound data, including operational tests of dimming systems.

G. Programming documentation for software.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Contactors:

a. Automatic Switch Co.
b. Challenger Electrical Equipment Corporation.
c. Furnas Electrical Co.
d. General Electric Co.
e. Square D Co.
f. Zenith Controls, Inc.

2. Time Switches:
a. Intermatic, Inc.

3. Photoelectric Relays:

a. Area Lighting Research, Inc.
b. Fisher Pierce.
c. Intermatic, Inc.
d. Paragon Electric.

2.2 LIGHTING CONTROL EQUIPMENT, GENERAL

A. Solid-State, Line-Voltage Equipment Surge Protection: Comply with UL 1449, “Transient Voltage Surge Suppressors”.

B. Load Compatibility: Lighting control equipment is compatible with the controlled loads.

C. Dimmers and Dimmer Modules: Comply with UL 508, “Electric Industrial Control Equipment”.

1. Noise and RFI Suppression: Solid-state dimmers that operate smoothly over their operating ranges without audible lamp noise or radio frequency interference (RFI) at any setting. Modules include filters for audible noise and RFI suppression.

2. Dimmer or Dimmer Module Rating: As indicated or, not less than 125 percent of the connected load.

2.3 CONTACTORS

A. Comply with NEMA ICS 2, “Industrial Control Devices, Controllers and Assemblies”. Devices are electrically operated and mechanically held. Number of poles and ratings are as indicated. Coordinate rating of each unit with type of load served, including tungsten filament type and inductive type loads.

2.4 TIME SWITCHES AND SENSORS

A. Time Switches: ET800CR Series Solid-state programmable units with alphanumeric display conforming to UL 917, “Clock Operated Switches”. Include the following features as indicated.

1. Surge Suppressor.

B. Photoelectric Relays: Conform to UL 773A, “Nonindustrial Photoelectric Switches for Lighting Control”. Relays are solid state, with SPDT dry contacts for relay or contactor control, and have time delay to prevent false operation. Include the following types:

1. Outdoor Sealed Units: Weathertight housing, resistant to high temperatures and equipped with sun glare shield and ice preventer.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install equipment according to manufacturer’s written instructions.

B. Mount control equipment according to manufacturer’s instructions.

C. Mounting heights indicated are to bottom of unit for suspended items and to center for wall-mounted ones.

3.2 CONTROL WIRING INSTALLATION

A. Install wiring between control devices as specified in Division 26.

B. Bundle, train, and support wiring in enclosures.

3.3 FIELD QUALITY CONTROL

A. Visual and Mechanical Inspections: Include the following inspections:

1. Inspect for defects and physical damage, NRTL labeling, and nameplate compliance with current project drawings.

2. Check tightness of electrical connections with torque wrench calibrated within the previous 6 months. Use manufacturer’s recommended torque values.

3. Verify proper protective device settings and fuse types and ratings.

4. Verify settings of photoelectric devices with photometer calibrated to NIST standards with the past 6 months.

5. Exercise mechanical parts and operable devices according to manufacturer’s instructions to verify proper operation.

3.4 CLEANING AND ADJUSTING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean equipment and devices internally and externally using methods and materials recommended by manufacturers.

B. Occupancy Adjustments: Upon request within 1 year of date of substantial completion, adjust light levels, make program changes, and adjust sensors and controls.

END OF SECTION 26 09 23

SECTION 26 22 13

LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general purpose and specialty dry type transformers and voltage regulators with windings rated 600 V or less.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product data for each product specified, including dimensioned plans, sections, and elevations. Show minimum clearances and installed features and devices.

C. Wiring diagrams of products differentiating between manufacturer-installed and field-installed wiring.

D. Operation and maintenance data for materials and products to include in the “Operating and Maintenance Manual” specified in Division 01.

E. Field test reports of tests and inspections conducted according to Part 3 of this Section.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 “National Electrical Code”.

B. Comply with IEEE C2 “National Electrical Safety Code”.

C. Listing and Labeling: Products are listed and labeled.

1. The Terms “Listed” and “Labeled”: As defined in the “National Electrical Code”, Article 100.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Transformers:

a. Square D
b. Siemens

c. Eaton

2.2 TRANSFORMERS, GENERAL

A. Transformers: Factory-assembled and-tested, air-cooled units of types specified, designed for 60-Hz service.

B. Cores: Grain-oriented, nonaging silicon steel.

C. Coils: Continuous windings without splices except for taps.

D. Internal Coil Connections: Brazed or pressure type.

2.3 GENERAL-PURPOSE, DRY-TYPE TRANSFORMERS

A. Comply with NEMA Standard ST 20 “Dry-Type Transformers for General Applications”.

B. Transformers: Two-winding type, 3-phase units using 1 coil per phase in primary and secondary.

C. Low Sound Level Units: Where indicated, minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE Standard C57.12.91, “Test Code for Dry-Type Distribution and Power Transformers”.

D. Features and Ratings: As follows:

1. Enclosure: Indoor, ventilated.

2. Enclosure: Exterior; totally enclosed, nonventilated, suitable for outdoor use.

E. Insulation Class: 185 deg C or 220 deg C class for transformers 15 kVA or smaller; 220 deg C class for transformers larger than 15 kVA.

1. Insulation Temperature Rise: 150 deg C maximum rise above 40 deg C, for 220 deg C class insulation; 115 deg C maximum rise for 185 deg C class insulation.

F. Taps: For transformers 3 KVA and larger, full capacity taps in high-voltage winding shall be six (6) 2.5 percent taps, 2 above and 4 below, rated high voltage.

G. Accessories: The following accessory items are required where indicated:

1. Surge Arresters: NEMA Standard LA 1, low-voltage type, factory installed and connected to low-voltage terminals.

2. Electrostatic Shielding: Where indicated; insulated metallic shield between primary and secondary windings.

a. Connect shield to terminal marked “Shield” for grounding connection.

b. Capacitance: Arrange shield to provide a maximum of 33 picofarads primary-to-secondary capacitance over a frequency range of 20 Hz to 1 MHz.

3. Wall-Mounting Brackets: Manufacturer’s standard brackets for transformers up to 75 kVA.

2.4 CONTROL AND SIGNAL TRANSFORMERS

A. Comply with NEMA Standard ST 1, “Specialty Transformers”, and UL Standard 506, “Specialty Transformers”.

B. Ratings: Continuous duty. Where ratings are not indicated, provide capacity exceeding peak load by 50 percent minimum.

C. Type: Self-cooled, 2-winding, dry type.

D. Enclosure: Suitable for the location where installed.

2.5 SOURCE QUALITY CONTROL

A. Factory Tests: Design and routine tests conform to referenced standards.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Arrange equipment to provide adequate spacing for access and for cooling air circulation.

B. Identify transformers and install warning signs according to Division 26 Section “Common Work Results for Electrical”.

C. Loosen internal mounting bolts for proper functioning of vibration isolation.

D. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. Where manufacturer’s torque values are not furnished, use those specified in UL 486A and UL 486B.

E. Install transformer on isolation pads. Size and type as recommended by manufacturer, where noted on plans.

F. Install transformer on concrete equipment pads.

3.2 GROUNDING

A. Ground transformers and systems served by transformers according to Division 26 Section “Grounding and Bonding for Electrical Systems”.

3.3 FIELD QUALITY CONTROL

A. Test Objectives: To ensure transformer installation is operational within industry and manufacturer’s tolerances, install according to Contract Documents, and suitable for energizing.

B. Tests: Include the following minimum inspections and tests according to the manufacturer’s instructions. Conform to IEEE Standard Test Code C57.12.91 for dry-type units, test method, and data correction factors.

1. Inspect accessible components for cleanliness, mechanical, and electrical integrity, for presence of damage or deterioration, and to ensure removal of temporary shipping bracing. Do not proceed with tests until deficiencies are corrected.

a. Include internal inspection through access panels and covers.

b. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, where not available, those of UL standards 486A and 486B.

2. Insulation Resistance: Perform megohmmeter test of primary and secondary winding-to-winding and winding-to-ground. Use a minimum test voltage of 1,000V d.c. Minimum insulation resistance is 500 megohms.

3. Duration of Each Test: 10 minutes.

4. Temperature Correction: Correct results for test temperature deviation from 20 deg C standard.

C. Test Failures: Correct deficiencies identified by tests and retest. Verify that equipment meets the specified requirements.

3.4 ADJUSTING

A. After completing installation, cleaning, and testing, touch up scratches and mars on finish to match original finish.

B. Adjust transformer taps to provide optimum voltage conditions at utilization equipment throughout the normal operating cycle of the facility. Record voltage and tap settings to submit with test results.

END OF SECTION 26 22 13

SECTION 26 24 13

SWITCHBOARDS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Requirements of the following Division 26 Sections apply to this Section:

1. "Common Work Results for Electrical."

1.2 SUMMARY

A. This Section includes low-voltage power service and distribution switchboards and associated auxiliary equipment rated 600 V or less.

B. Related Sections: The following Division 26 sections contain requirements that relate to this Section:

1. "Enclosed Switches and Circuit Breakers" for circuit breakers, fusible switches, fuses and other similar devices used in switchboards.

2. "Identification for Electrical Systems" for identification and warning signs for switchboards and switchboard components.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product data for each product and component specified.

C. Shop drawings for each switchboard including dimensioned plans and elevations, component and device lists, and a single-line diagram showing main and branch bus current ratings and short-time and short-circuit ratings of switchboard.

D. Shop drawings of utility company metering provisions with indication of approval by utility company.

E. Schedule of features, characteristics, ratings and factory settings of individual protective devices.

F. Manufacturer's Schematic Wiring Diagram.

G. Coordination Drawings.

1. Prepare coordination drawings in accordance with Division 01 Section "Project Coordination", to a scale of ¼" = 1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where

space is limited for installation and access, including (but not necessarily limited to) the following:

a. Indicate the proposed locations of major switchboards, equipment, and materials. Include the following:

1) Clearances for servicing equipment.
2) Equipment connections and support details.
3) Sizes and location of required concrete pads and bases.

H. Report of field tests and observations certified by the testing organization.

I. Maintenance data for materials and products, for inclusion in Operating and Maintenance Manual specified in Division 01 and in Division 26 Section “Common Work Results for Electrical”.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide switchboard assemblies that are listed and labeled.

1. The terms “listed” and “labeled”: As defined in the National Electrical Code, Article 100.

B. Field-Testing Organization Qualifications: To qualify for acceptance, the testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.

C. Electrical Component Standard: Components and installation shall comply with NFPA 70, “National Electrical Code”.

D. NEMA Standard: Comply with NEMA Standard PB2, “Deadfront Distribution Switchboards”.

E. UL Standard: Comply with UL 891, “Deadfront Switchboards”.

F. Product Selection for Restricted Space: The Drawings indicate normal dimensions for switchboard equipment including clearances between switchboard and adjacent surfaces and items. Switchboards having equal performance characteristics and complying with code clearances and space restrictions may be considered.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store so condensation will not occur on or in switchboards.

B. Handle switchboards in accordance with NEMA Standard PB2.1, “General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards”. Use factory-installed lifting provisions.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Square D
2. Eaton
3. Siemens

2.2 SWITCHBOARDS, GENERAL

A. Description: Front-connected, front-accessible, with panel-mounted main device, panel-mounted branches and sections rear aligned.

B. Description: Front-connected, front-accessible, with fixed, individually mounted main device, panel-mounted branches and sections rear aligned.

C. Description: Front-and rear-accessible sections, front and rear aligned, with features as follows:

1. Main Device: Individually fixed mounted.
2. Branch Devices: Individually fixed mounted.

D. Barriers: Between adjacent switchboard sections.

1. Insulation and isolation for main and vertical buses of feeder sections.

2.3 FABRICATION AND FEATURES

A. Enclosure: Steel. Exterior locations or where noted: NEMA 3R, rainproof. Interior locations: NEMA 1.

B. Enclosure Finish for Outdoor Units: UL 891, Paragraph 9.22 C.2, manufacturer's standard color. Undersurfaces shall additionally receive a corrosion-resistant undercoating treatment. The finish system shall meet the requirements of tests in accordance with IEEE C37.20.1, "Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear", paragraph 5.2.8.

C. Enclosure Finish for Indoor Units: Manufacturer standard gray finish over a rust inhibiting primer on phosphatizing treated metal surface. Provide painted surfaces that conform to IEEE C37.20.1, "Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear", paragraph 5.2.8.

D. Utility Metering Compartment: Fabricated compartment and section meeting utility company requirements. Where separate vertical section is required for utility metering, match and align with basic switchboard.

E. Bus Transition and Incoming Line Pull Sections: Match and align with basic switchboard.

F. Hinged Front Panels: Provide to allow access to breaker, meeting, accessory, and blank compartments.

G. Buses and Connections: Three-phase, four-wire except as otherwise indicated. Features as follows:

1. Phase and Neutral Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with copper or tin-plated aluminum circuit-breaker line connections.

2. At load terminals of feeder breakers, provide silver-plated copper bus extensions equipped with pressure terminal connectors for outgoing circuit conductors.

3. Ground Bus: ¼-inch by 2-inch minimum size, hard-drawn copper of 98 percent conductivity, and equipped with pressure connector terminations for feeder- and branch-circuit ground conductors.

4. Supports and Bracing for Buses: Adequate strength for indicated short-circuit currents.

5. Contact Surfaces of Buses: Silver plated.

6. Main Phase Buses, Neutral Bus, and Equipment Ground Bus: Uniform capacity the entire length of the switchboard main and distribution sections. Provide for future extensions from either end by means of bolt holes or other approved method and connecting links.

7. Neutral Buses: 100 percent of the ampacity of the phase buses except as indicated and equipped with approved pressure connector terminations for outgoing circuit neutral cables. Provide braced neutral bus extensions for busway feeders with neutral conductors.

2.4 OVERCURRENT PROTECTIVE DEVICES (OCPDs)

A. Comply with requirements of Division 26 Section “Enclosed Switches and Circuit Breakers” for types of OCPDs indicated. Provide indicated features, ratings, characteristics, and settings.

B. Future Devices: Where provision for future overcurrent protective devices or space is indicated, equip compartments with mounting brackets, supports, bus connections, and necessary appurtenances, designed for the OCPD types and ampere ratings indicated for future installation of devices.

2.5 OTHER CIRCUIT CONTROL AND PROTECTIVE DEVICES

A. General: Factory installed and tested devices of types listed below, with indicated ratings, settings, and features.

1. Combination Motor Starter: Use units with fusible switch disconnects.

2. Surge Arresters: As specified in IEEE C62.11, “Standards for Metal-Oxide Surge Arresters for AC Power Circuits” or IEEE C62.1 “Surge Arresters for Alternating Current Power Circuits”.

a. Description: Coordinate impulse sparkover voltage with system circuit voltage, and provide factory mounting and connection.

2.6 CONTROL POWER

A. General: Where electrically operated devices or ground fault relays requiring external power are indicated, provide 120V control circuits supplied through secondary disconnect devices from control power transformer.

B. Control Power Fuses: Include primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

C. Control Wiring: Factory installed, complete with bundling, lacing and protection. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.7 RATINGS

A. Provide nominal system voltage, continuous main bus amperage, and short circuit current ratings as indicated.

2.8 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: Arranged to permit testing of all functions of solid state trip devices without removal from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.

2.9 IDENTIFICATION

A. General: Refer to Division 26 Section “Identification for Electrical Systems”. Identify units, devices, controls, and wiring with factory applied labels and signs.

B. Compartment Nameplates: Engraved laminated plastic or metal nameplate for each compartment, mounted with corrosion resistant screws.

C. Provide a one-line diagram of the electrical power system, posted under plastic near the service entrance section.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install switchboards and accessory items in accordance with manufacturer’s written installation instructions and the following specifications:

B. Anchor each switchboard assembly with anchor bolts to two 4-inch-minimum channel-iron sills arranged in accordance with manufacturer’s recommendations. Attach by tack welding or bolting. Level and grout sills flush with switchboard mounting surface.

C. Strength, Spacing, and Placement of Equipment Housekeeping Pads: Where indicated, provide a concrete housekeeping pad. Fabricate pads as follows:

1. Coordinate size of equipment bases with actual unit sizes provided. Fabricate base 4 inches larger in both directions than the overall dimensions of the supported unit.

2. Form concrete pads with framing lumber with form release compounds. Chamfer top edge and corners of pad.

3. Install reinforcing bars, tied to frame, and place anchor bolts and sleeves to facilitate securing units.

4. Place concrete and allow to cure before installation of units. Use Portland cement that conforms to ASTM C 150, 4000-psi compressive strength, and normal weight aggregate.

5. For outdoor switchboard pads, provide footings.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

E. Operating Instructions: Frame and mount printed, basic operating instructions for switchboards, including control and key interlocking sequences, and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on the front of the switchboards.

3.2 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs as specified in Division 26 Section “Identification for Electrical Systems”.

3.3 GROUNDING

A. Connections: As indicated. Tighten connections to comply with tightening torques specified in UL 486A and 486B.

B. Ground equipment to main electrical ground bus indicated.

3.4 CONNECTIONS

A. Tighten switchboard bus joint bolts and electrical connector and terminal bolts in accordance with manufacturer’s published torque-tightening values. Where manufacturer’s torque values are not stated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. General: Comply with applicable standards of the Inter National Electrical Testing Association (INETA) including Standard ATS, “Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems”.

B. Independent Testing Organization: Arrange and pay for the services of an independent electrical testing organization to perform quality control electrical testing and calibration, visual and mechanical inspections and tests of overcurrent protective devices in switchboards.

C. Pretesting: Upon completing installation of the system, perform the following preparations for tests:

1. Make insulation resistance tests of switchboard buses, components, and connecting supply, feeder and control circuits.

2. Make continuity tests of circuits.

3. Provide set of Contract Documents to test organization. Include full updating on final system configuration and parameters where they supplement or differ from those indicated in original Contract Documents.

4. Provide manufacturer’s instructions for installation and testing of switchboard to test organization.

D. Quality Control Testing Program: Conform to the following:

1. Program Objectives: To assure switchboard installation meets specified requirements, is operational within specified tolerances, provides appropriate protection for systems and equipment and is suitable for energizing.

2. Procedures: Make field tests and inspections and prepare switchboard for satisfactory operation in accordance with manufacturer's recommendations and these specifications.

3. Schedule tests and notify Architect at least one week in advance of test commencement.

4. Reports: Prepare written reports of test results and observations. Report defective materials and workmanship. Include complete records of adjustments and remedial efforts.

5. Labeling: Upon satisfactory completion of tests and related effort apply a label to tested components indicating test results, person responsible and date.

6. Protective Device Ratings and Settings: Verify indicated ratings and settings and make the final system adjustments of OCPDs in accordance with Division 26 Section "Enclosed Switchess and Circuit Breakers" and "Fuses".

E. Visual and Mechanical Inspections: Include the following inspections and related work:

1. Inspect for defects and physical damage, testing laboratory, labels and nameplate compliance with up-to-date circuit connections.

2. Verify that potential transformers, including their overcurrent protection and current transformers, meet specified requirements.

3. Perform operational test and exercise of mechanical components and other operable devices in accordance with manufacturer's instruction manual.

4. Check switchboard anchorage, area clearances, and alignment and fit of components.

5. Check tightness of bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.

6. Clean switchboard interior and exterior using manufacturer's approved methods and materials.

7. Perform visual and mechanical inspection and related work for OCPDs as specified in Section "Disconnect and Circuits Breakers" and "Fuses".

F. Electrical Tests: Include the following items performed in accordance with manufacturer's instruction:

1. Insulation resistance test of buses and portions of control wiring that disconnect from solid state devices through normal disconnecting features. Insulation resistance less than 100 megohms is not acceptable.

2. Ratio and polarity tests on current and voltage transformers.

3. Ground resistance test on system and equipment ground connections.

4. Test overcurrent protective devices as specified in Section “Disconnects and Circuit Breakers”.

G. Retesting: Correct deficiencies identified by tests and observations and retest switchboards. Verify by the retests that switchboards meet specified requirements.

3.6 CLEANING

A. Upon completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots, dirt and debris of pulling compound. Touch up scratches and mars of finish to match original finish.

3.7 COMMISSIONING

A. Infrared Scanning: After Substantial Completion, but not more than 2 months after Final Acceptance, perform an infrared scan of switchboard bus joints and connections. Open or remove metal doors, covers, inspection plates, and barriers to make joints and connections accessible to a portable scanner.

B. Follow-up Infrared Scanning: Perform 2 additional follow-up infrared scans of the same joints and connections, one 4 months after Substantial Completion and one 11 months after Substantial Completion.

C. Instrument: Use an infrared scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.

D. Record of Infrared Scanning: Prepare a certified report identifying all connections checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 24 13

SECTION 26 24 16

PANELBOARDS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Requirements of the following Division 26 Sections apply to this Section:

1. "Common Work Results for Electrical".
2. "Identification for Electrical Systems".

1.2 SUMMARY

A. This Section includes lighting and power panelboards and associated auxiliary equipment rated 600V or less.

B. Related Sections: The following Division 26 Sections contain requirements that relate to this Section:

1. "Enclosed Switches and Circuits Breakers" for circuit breakers used in panelboards.

1.3 DEFINITIONS

A. Over Current Protective Device (OCPD): A device operative on excessive current that causes and maintains the interruption of power in the circuit it protects.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

B. Product data for each type panelboard, accessory item, and component specified.

C. Shop drawings from manufacturers of panelboards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:

1. Enclosure type with details for types other than NEMA Type 1.
2. Bus configuration and current ratings.
3. Short-circuit current rating of panelboard.
4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

D. Panel schedules for installation in panelboards. Submit final versions after load balancing.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The terms “listed” and “labeled” shall be defined as they are in the National Electrical Code, Article 100.

B. Electrical Component Standard: Components and installation shall comply with NFPA 70, “National Electrical Code”.

C. NEMA Standard: Comply with NEMA PB1, “Panelboards”.

D. UL Standards: Comply with UL 61, “Panelboards”, and UL 50, “Cabinets and Boxes”.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Square D
2. Eaton
3. Siemens

2.2 PANELBOARDS, GENERAL REQUIREMENTS

A. Over Current Protective Devices (OCPDs): Provide type, rating, and features as indicated. Tandem circuit breakers shall not be used. Multipole breakers shall have common trip.

B. Enclosures: Cabinets, flush or surface mounted as indicted. NEMA Type 1 enclosure, except where the following enclosure requirements are indicated.

1. NEMA 3R: Raintight.

C. Directory Frame: Metal, mounted inside each panel door.

D. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors, bonded to box.

E. Service Equipment Approval: Listed for use as service equipment for panelboards having main service disconnect.

F. Hinged Front Cover: Entire front trim hinged to box with standard door within hinged trim cover.

G. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for the OCPD ampere ratings indicated for future installation of devices.

H. Special Features: Provide the following features for panelboards as indicated.

1. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.

2. Skirt For Surface-Mounted Panels: Same gage and finish as panel front with flanges for attachment to panel, wall, and floor.

3. Subfeed: OCPD or lug provision as indicated.

4. Feed-Through Lugs: Sized to accommodate feeders indicated.

5. Surge Arresters: IEEE C62.11, “Standards for Metal-Oxide Surge Arresters for AC Power Circuits”, or IEEE C62.1, “Surge Arresters for Alternating Current Power Circuits”.

   a. Description: Coordinate impulse sparkover voltage with system circuit voltage and provide factory mounting with UL-recognized mounting device.

6. Circuit Breakers for Switching Lights at Panelboards: Indicated type SWD.

7. Circuit Breakers for Equipment Marked HCAR Type: Indicated HCAR type.

2.3 LOAD CENTERS

A. Load-center-type panelboards are not permitted.

2.4 LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS

A. Branch OCPDs: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Double-Width Panels: Where more than 42 poles are indicated or where otherwise indicated, provide two panelboards under single front.

C. Doors: In panel front, with concealed hinges. Secure with flush catch and tumbler lock, all keyed alike.

2.5 DISTRIBUTION PANELBOARDS

A. Doors: In panel front, omit single panelboard door in cabinet front for fusible switch panelboards except as indicated. Secure with vault-type with tumbler lock, all keyed alike.

B. Branch-Circuit Breakers: Where OCPDs are indicated to be circuit breakers, use bolt-on breakers except circuit breakers 225-ampere frame size and greater may be plug-in type where individual positive locking device requires mechanical release for removal.

C. Motor Starter Branches: Provide units equipped for panelboard mounting. Include the following accessories and pilot devices as indicated:

1. Individual control power transformers.
2. Fuses for control power transformers.
3. Pilot lights.
4. Extra interlock contacts.
5. Pushbuttons.
6. Selector switches.

D. Motor Starter Disconnects: Include overcurrent protection as indicated. Mount integral with or, in same panelboard, adjacent to motor starter. Mechanically interlock starter door with disconnect device. Provide auxiliary contacts on disconnect to de-energize control connections to starter.

2.6 IDENTIFICATION

A. General: Refer to Division 26 Section “Common Work Results for Electrical” for labeling materials.

B. Panelboard Nameplates: Engraved laminated plastic or metal nameplate for each panelboard mounted with epoxy or industrial cement or industrial adhesive.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install panelboards and accessory items in accordance with NEMA PB 1.1, “General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less” and manufacturer’s written installation instructions.

B. Mounting Heights: Top of trim 6’-2” above finished floor, except as indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.

D. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval before installing.

E. Install filler plates in unused spaces.

F. Provision for Future Circuits at Flush Panelboards: Stub three 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future. Stub four 1-inch empty conduits into raised floor space or below slab other than slabs on grade.

G. Wiring in Panel Gutters: Train conductors neatly in groups, bundle, and wrap with wire ties after completion of load balancing.

3.2 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs in accordance with Division 26 Section “Identification for Electrical Systems”.

3.3 GROUNDING

A. Connections: Make equipment grounding connections for panelboards as indicated.

B. Provide ground continuity to main electrical ground bus indicated.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals, including grounding connections, in accordance with manufacturer’s published torque-tightening values. Where

manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Pretesting: Upon completing installation of the system, perform the following preparations for independent tests:

1. Make insulation resistance tests of panelboard buses, components, and connecting supply, feeder, and control circuits.

2. Make continuity tests of circuits.

B. Quality Control Program: Conform to the following:

1. Procedures: Make field tests and inspections and prepare panelboard for satisfactory operation in accordance with manufacturer's recommendations and these specifications.

C. Visual and Mechanical Inspection: Include the following inspections and related work:

1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date drawings and panelboard schedules.

2. Exercise and perform operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.

3. Check panelboard mounting, area clearances, and alignment and fit of components.

4. Check tightness of bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.

5. Perform visual and mechanical inspection and related work for over current protective devices as specified in Division 26 Section "Enclosed Switches and Circuits Breakers" and "Fuses".

D. Retest: Correct deficiencies identified by tests and observations and provide retesting of panelboards by testing organization. Verify by the system tests that the total assembly meets specified requirements.

3.6 CLEANING

A. Upon completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.7 COMMISSIONING

A. Balancing Loads: After Substantial Completion, but not more than two months after Final Acceptance, conduct load-balancing measurements and circuit changes as follows:

1. Perform measurements during period of normal working load as advised by the Owner.

2. Perform load-balancing circuit changes outside the normal occupancy/working schedule of the facility. Make special arrangements with Owner to avoid disrupting critical 24-hour services such as FAX machines and on-line data processing, computing, transmitting, and receiving equipment.

3. Recheck loads after circuit changes during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference between phase loads exceeding 20 percent at any one panelboard is not acceptable. Rebalance and recheck as required to meet this minimum requirement.

B. Infrared Scanning: After Substantial Completion, but not more than two months after Final Acceptance, perform an infrared scan of each panelboard. Remove fronts to make joints and connections accessible to a portable scanner.

C. Follow-up Infrared Scanning: Perform one additional follow-up infrared scan of each panelboard 11 months after the date of Substantial Completion.

D. Instrument: Use an approved infrared scanning device designed to measure temperature or detect significant deviations from normal values. Provide calibration record for device used.

E. Record of Infrared Scanning: Prepare a certified report identifying panelboards checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 24 16

SECTION 26 27 26

WIRING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes various types of receptacles, connectors, switches, and finish plates.

1.3 SUBMITTALS

A. Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product data for each product specified.

C. Operation and maintenance data for materials and products specified in this Section to include in the "Operating and Maintenance Manual" specified in Division 01.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for devices and installation.

B. Listing and Labeling: Provide products that are listed and labeled for their applications and installation conditions and for the environments in which installed.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code", Article 100.

1.5 COORDINATION

A. Wiring Devices for Owner Furnished Equipment: Match devices to plug connectors for owner furnished equipment.

B. Cord and Plug Sets: Match cord and plug sets to equipment requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

    a. Arrow Hart Div., Cooper Industries.
    b. Bryant Electric, Inc.
    c. Hubbell Inc.
    d. Leviton Mfg. Co., Inc.
    e. Pass & Seymour/Legrand.
    f. Slater Electric, Inc.

2. Exterior/Wet Location Plates:

    a. TayMac.
    b. Pass and Seymour.

3. Multi-Outlet Assemblies:

    a. Wiremold Co.

4. Floor Service Outlets: Steel City.

2.2 WIRING DEVICES

A. Comply with NEMA Standard WD 1, “General Purpose Wiring Devices”.

B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.

C. Material: Stainless Steel except as otherwise indicated or required by Code.

D. Receptacles, Straight-Blade and Locking Type: Comply with UL Standard 498, “Electrical Attachment Plugs and Receptacles”, heavy-duty grade except as otherwise indicated.

E. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicated, and with the following additional requirements:

1. Ground-Fault Circuit Interrupter (GFCI) Receptacles: UL Standard 943, “Ground Fault Circuit Interrupters”, feed-through type, with integral NEMA 5-20R duplex receptacle arranged to protect connected downstream receptacles on the same circuit. Design units for installation in a 2-3/4-inch (70-mm) deep outlet box without an adapter.

2. Isolated Ground Receptacles: Equipment grounding contacts are connected only to the green grounding screw terminal of the device and have inherent electrical isolation from the mounting strap.

    a. Devices: Listed and labeled as isolated ground receptacles.

    b. Isolation Method: Integral to the receptacle construction and not dependent on removable parts.

    c. Color: Orange.

F. Cord and Plug Sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.

1. Cord: Rubber-insulated, stranded copper conductors, with type SOW-A jacket. Grounding conductor has green insulation. Ampacity is equipment rating plus 30 percent minimum.

2. Plug: Male configuration with nylon body and integral cable-clamping jaws. Match to cord and to receptacle type intended for connection.

G. Snap Switches: Quiet-type a.c. switches, NRTL listed and labeled as complying with UL Standard 20 “General Use Snap Switches”, and with Federal Specification W-S-896.

H. Dimmer Switches: Modular full-wave solid state units with integral, quiet on-off switches, and audible and electromagnetic noise filters.

1. Wattage rating exceeds connected load by 30 percent minimum, except as otherwise indicated.

2. Control: Continuously adjustable slide, toggle or rotary knob. Single-pole or 3-way switch to suit connections.

3. Incandescent Lamp Dimmers: Modular dimmer switches for incandescent fixtures; switch poles and wattage as otherwise indicated, 120V, 60 Hz with continuously adjustable toggle, or slide, single-pole with soft tap or other quiet switch. Equip with electromagnetic filter to eliminate noise, RF and TV interference, and 5-inch (127-mm) wire connecting leads.

I. Key Switches: Pass and Seymour 20 AC-KL Series.

1. Provide manufacturer’s matching cover plate.

J. Wall Plates: Single and combination types that mate and match with corresponding wiring devices. Features include the following:

1. Plate-Securing Screws: Metal with heads colored to match plate finish.

2. Material for Finished Spaces: 0.04 inches thick, type 302, satin-finished stainless steel, except as otherwise indicated.

3. Material for Unfinished Spaces: Galvanized steel.

K. Material for exterior and set locations:

1. Material: Polycarbonate or cast aluminum door.
2. Listing: “Suitable for wet locations while in use”.
3. Locking: Tumble lock, keyed alike.

2.3 FLOOR SERVICE OUTLET ASSEMBLIES

A. Types: In-floor, dual-service units suitable for the wiring method used.

B. Compartmentation: Barrier separates power and signal compartments.

C. Housing Material: Galvanized steel.

D. Power Receptacle: NEMA configuration 5-20R, stainless steel finish, except as otherwise indicated.

E. Signal Outlet: Blank cover with bushed cable opening, except as otherwise indicated.

F. Finish Cover: Steel with non-metallic trim.

2.4 MULTI-OUTLET ASSEMBLIES

A. Comply with Standard UL 5, “Surface Metal Raceways and Fittings”.

B. Components of Assemblies: Products of a single manufacturer designed to be used together to provide a complete matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer’s standard corrosion-resistant finish.

D. Wire: No. 12 AWG.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

C. Exterior Receptacles: Mount outlet box recessed 2 inches from finished surface with gasketing between enclosure and finish surface.

D. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates. Above countertop mount horizontal.

E. Protect devices and assemblies during painting.

F. Adjust locations at which floor service outlets are installed to suit the indicated arrangement of partitions and furnishings.

G. Install GFCI receptacles within 6 feet of a sink, in kitchens, wet locations, exterior locations and toilets.

3.2 IDENTIFICATION

A. Comply with Division 26 Section “Identification for Electrical Systems”.

1. Switches: Where 3 or more switches are ganged, and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.

2. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 GROUNDING

A. Isolated Ground Receptacles: Connect to isolated grounding conductor routed to designated isolated equipment ground terminal of electrical system.

3.4 FIELD QUALITY CONTROL

A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least 6 times.

B. Test ground-fault circuit interrupter operation with local fault simulations according to manufacturer's recommendations.

C. Replace damaged or defective components.

3.5 CLEANING

A. General: Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 26 27 26

SECTION 26 28 13

FUSES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fuses.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product data and Manufacturer name.

1. Descriptive data and time-current curves.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 “National Electrical Code” for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms “Listed” and “Labeled” As defined in the “National Electrical Code”, Article 100.

C. Single-Source Responsibility: All fuses shall be the product of a single manufacturer.

1.5 EXTRA MATERIALS

A. Furnish the following extra materials that match products installed, packaged with protective covering for storage, and with identification labels clearly describing contents.

B. Spare Fuses: Furnish quantity equal to 10 percent of each fuse type and size installed, but not less than 1 set of 3 of each type and size.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:

1. Bussmann Div., Cooper Industries, Inc.

2. Circuit Protection Div., Gould, Inc.
3. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1 nonrenewable cartridge fuse, class as specified or indicated, current rating as indicated, voltage rating consistent with circuit voltage.

B. Main Service: Class L fast acting.

C. Main Feeders: Class RK1 time delay, current limiting.

D. Motor Branch Circuits: Class RK1 time delay.

E. Other Branch Circuits: Class RK5 non-time delay.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install fuses in fusible devices as indicated. Arrange fuses so that fuse ratings are readable without removing fuse.

B. Verify ratings and class to suit actual motor or equipment served.

3.2 IDENTIFICATION

A. Install typewritten labels on the inside door of each fused switch to indicate fuse replacement information.

END OF SECTION 26 28 13

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Service disconnects.
2. Feeder and equipment disconnects.
3. Enclosed circuit breakers.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product data for circuit breakers, and accessories specified in this Section.

C. Descriptive data and time-current curves for protective devices and let-through current curves for those devices with current-limiting characteristics. Include coordination charts and tables, and related data.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 “National Electrical Code” for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms “Listed” and “Labeled”: As defined in the “National Electrical Code,” Article 100.

C. Single-Source Responsibility: All enclosed switches and circuit breakers shall be the product of a single manufacturer.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide enclosed switches and circuit breakers by one of the following:

1. Fusible Switches:

a. Square D
b. Eaton

c. Siemens

2. Molded-Case Circuit Breakers:

a. Square D
b. Eaton
c. Siemens

2.2 ENCLOSED SWITCHES

A. Enclosed Nonfusible Switch: NEMA KS 1, Type HD, handle lockable with 2 padlocks.

B. Enclosed fusible Switch, 800 Amperes and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.

C. Enclosure: NEMA KS 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.

1. Outdoor Locations: Type 3R.
2. Kitchen Areas: Type 4X, stainless steel.

2.3 ENCLOSED CIRCUIT BREAKERS

A. Enclosed Molded-Case Circuit Breaker: NEMA AB 1, handle lockable with 2 padlocks.

B. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated; interrupting capacity rating to meet available fault current, 10,000 symmetrical rms amperes minimum; with appropriate application listing when used for switching fluorescent lighting loads or heating, air conditioning, and refrigeration equipment.

C. Interchangeable Trips: Circuit breakers, 200 amperes and larger, with trip units interchangeable within frame size.

D. Field-Adjustable Trips: Circuit breakers, 400 amperes and larger, with adjustable short time and continuous current settings.

E. Current Limiting Trips: Where indicated, let-through ratings less than NEMA FU1, Class RK-5.

F. Current Limiters: Where indicated, integral fuse listed for circuit breaker.

G. Molded-Case Switch: Where indicated, molded-case circuit breaker without trip units.

H. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

I. Shunt Trip: Where indicated, 120 volts, 60 Hz.

J. Series Rating: Where indicated, breakers listed by manufacturer for available fault current and indicated on enclosure.

K. Solid-State Trip: Where indicated, interchangeable trips, with the following:

1. Adjustable current setting and delays.
2. Long and short time.

3. Ground fault pick-up and delay.
4. I-Square T on/off selection.

L. Accessories: As indicated.

M. Enclosure: NEMA AB 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.

1. Outdoor Locations: Type 3R.
2. Kitchen Areas: Type 4X, stainless steel.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install enclosed switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.

B. Install enclosed switches and circuit breakers level and plumb.

C. Connect enclosed switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts according to equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

D. Verify rating and setting to suit actual motor or equipment served.

3.2 FIELD QUALITY CONTROL

A. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Standard ATS, Section 7.5 for enclosed switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

B. Correct malfunctioning units at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

3.3 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION 26 28 16

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.

B. Related Sections: The following Division 26 Sections contain requirements that relate to this Section:

1. “Exterior Lighting” for exterior security lighting and parking lot lighting, poles, and standards.

2. “Lighting Control Devices” for modular dimmers, time switches, photoelectric relays and contactors.

1.3 DEFINITIONS

A. Emergency Lighting Unit: A fixture with integral emergency battery power supply and the means for controlling and charging the battery. They are also known as an emergency light set. Emergency units are available with integral lamps only.

B. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute the light, position and protect lamps, and connect lamps to the power supply. Internal battery powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units are available with and without integral lamp heads and lamps.

C. Luminaire: Fixture.

D. Average Life: The time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and the following information:

1. Outline drawings of fixtures indicating dimensions and principal features.

2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory test when requested.

3. Data on batteries and chargers of emergency lighting units.

C. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 01.

D. Shop drawings from manufacturers detailing nonstandard fixtures and indicating dimensions, weights, methods of field assembly, components, features, and accessories.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70 “National Electrical Code” for components and installation.

B. Listing and Labeling: Provide fixtures and emergency lighting units that are listed and labeled for their indicated use on the Project.

1. Special Listing and Labeling: Provide fixture for use in damp or wet locations, and recessed in combustible construction specifically listed and labeled for such use.

2. The terms “Listed” and “Labeled”: As defined in the National Electrical Code, Article 100.

C. Coordination of Fixtures with Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system.

1.6 WARRANTY

A. Special Project Warranty: Submit a warranty, mutually executed by Manufacturer and the Installer, agreeing to replace rechargeable system batteries that fail in materials or workmanship within the special project warranty period specified below. This warranty is in addition to, and not a limitation of, other rights and remedies the Owner may have under the Contract Documents.

1. Special Project Warranty Period: 10 years, beginning on the date of Substantial Completion. A full warranty shall apply for the first 2 years of the period, and a prorated warranty for the last 8 years.

1.7 EXTRA MATERIALS

A. Furnish extra materials matching products installed, as described below, packaged with protective covering for storage, and identified with labels describing contents. Deliver extra materials to the Owner.

1. Lamps: 10 lamps for each 100 of each type and rating installed. Furnish at least 1 of each type.

2. Plastic Diffusers and Lenses: 1 for each 100 of each type and rating installed. Furnish at least 1 of each type.

3. Ballasts: 1 for each 100 of each type and rating installed. Furnish at least 1 of each type.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the following:

B. Lamps:

1. General Electric
2. Osram Sylvania
3. Phillips Lightings

C. Ballast:

1. Advance
2. Motorola
3. Valmont Electric
4. Magnetek

2.2 FIXTURES, GENERAL

A. Comply with the requirements specified in the Articles below and lighting fixture schedule.

2.3 FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs and sharp corners and edges.

B. Sheet Metal Components: Steel, except as indicated. Components are formed and supported to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under operating conditions. Arrange to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in the operating position.

D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed crystal glass except as indicated.

1. Plastic: Highly resistance to yellowing and other changes due to aging, exposure to heat and UV radiation.

2. Lens Thickness: 0.125 inches, minimum.

2.3 SUSPENDED FIXTURE SUPPORT COMPONENTS

A. Single-Stem Hangers: ½-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

B. Rod Hangers: 3/16-inch diameter cadmium plated, threaded steel rod.

2.4 FLUORESCENT FIXTURES

A. Fixtures: Conform to UL 1570, “Fluorescent Lighting Fixtures”.

B. Electronic Ballasts: Solid-state, full-light-output, energy-saving type compatible with energy-saving lamps. Conform to FCC Regulations Part 15, Subpart J, Electromagnetic Interference. Conform to IEEE C62.41, “Guide for Surge Voltage in Low-Voltage AC Power Circuits”, Category A, for resistance to voltage surges for normal and common modes.

1. Minimum Power Factor: 90 percent.

2. Minimum Operating Frequency: 20,000 Hz.

3. Third Harmonic Content of Ballast Current: Less than 10 percent.

4. Average Input: The following is the average required wattage when tested according to ANSI C82.2, “Fluorescent Lamp Ballasts, Methods of Measurement”:

a. 66 or less watts when operating two (2) F32T8 lamps.
b. 121 or less watts when operating four (4) F32T8 lamp.

C. Dimming Ballasts: Solid-state type, for smooth dimming over a range from 100 percent to 10 percent light output and listed for use with the specific fluorescent dimming system. Dimming systems are specified in Division 26 Section “Lighting Control Devices”.

1. Conform to FCC Regulations Part 15, Subpart J, for electromagnetic interference.

2. Conform to IEEE C62.41, “Guide for Surge Voltages in Low-Voltage AC Power Circuits”, Category A, for resistance to voltage surges for normal and common modes.

3. Minimum Power Factor: 90 percent, when connected according to manufacturer’s instructions to control system at 100-percent output and operating standard 32-watt rapid start lamps.

2.6 HIGH INTENSITY DISCHARGE (HID) FIXTURES

A. Fixtures: Conform to UL 1572, “High-Intensity Discharge Lighting Fixtures”.

B. Ballasts: Conform to UL 1029, “High-Intensity-Discharge Lamp Ballasts” and ANSI C82.4, “Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)”. Provide ballasts with the following features, except as otherwise indicated:

1. Constant wattage autotransformer (CWA) or regulator, high-power-factor type.

2. Voltage rating matches system voltage.

3. Single-Lamp Ballasts: Minimum starting temperature of minus 30 deg C.

4. Normal ambient operating temperature is 40 deg C.

5. Open circuit operation will not reduce the average life.

6. High pressure sodium (HPS) ballasts incorporate a solid-state ignitor/starter with an average life in the pulsing mode of 10,000 hours at an ignitor/starter case temperature of 90 deg C.

7. Noise Suppression: Manufacturer's standard epoxy encapsulated model designed to minimize audible fixture noise.

C. Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp when the fixture is initially energized and when momentary power outages occur. Turn quartz lamp off automatically when HID lamp reaches approximately 60-percent light output. Ballasts have internal components independent of the incoming line voltage.

2.7 INCANDESCENT FIXTURES

A. Conform to UL 1571, "Incandescent Lighting Fixtures".

2.8 LED FIXTURES

A. Provide as shown on the drawings.

2.9 LAMPS

A. Conform to ANSI Standards, C78 series applicable to each type of lamp.

2.10 FINISH

A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project warranty period and replace with new fixtures.

B. Other Parts: Manufacturer's standard finish.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved shop drawings.

B. Support for Recessed and Semi-recessed Fixtures: Install ceiling system support rods or wires at a minimum of four rods or wires per fixture located not more than 6 inches from fixture corners. Attach directly to structure independent of T-grid ceiling system.

1. Fixtures Smaller Than Ceiling Grid: Install a minimum of four rods or wires for each fixture and locate at corner of the ceiling grid where the fixture is located. Do not support fixtures by ceiling acoustical panels.

2. Fixtures of Sizes Less Than Ceiling Grid: Center in the acoustical panel. Support fixtures independently with at least two ¾-inch metal channels spanning and secured to the ceiling tees.

3. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corners.

C. Support for Suspended Fixtures: Brace pendants and rods that are 4-feet long or longer to limit swinging. Support stem mounted single-unit suspended fluorescent fixtures with two-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.

D. Lamping: Lamp units according to manufacturer's instruction.

3.2 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Give advance notice of dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following in tests of emergency lighting equipment.

1. Duration of supply.
2. Low battery voltage shut-down.
3. Normal transfer to battery source and retransfer to normal.
4. Low supply voltage transfer.

E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.3 ADJUSTING AND CLEANING

A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 26 51 00

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior lighting fixtures, lamps, ballasts, poles standards, and accessories.

B. Related Sections: The following Division 26 Sections contain requirements that relate to this Section:

1. “Interior Lighting” for interior fixtures, lamps, ballasts, emergency lighting units, and accessories.

2. “Lighting Control Devices” for modular dimmers, time switches, photoelectric relays and contactors.

1.3 DEFINITIONS

A. Fixture: A complete lighting unit. Fixtures include a lamp or lamps and parts required to distribute the light, position and protect lamps, and connect lamps to the power supply.

B. Lighting Unit: A fixture, or an assembly of fixtures with a common support, including a pole or bracket plus mounting and support accessories.

C. Luminaire: A fixture.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 01 Specification Sections.

B. Product data describing fixtures, lamps, ballasts, poles, and accessories. Arrange product data for fixtures in order of fixture designation. Include data on features, poles, accessories, and the following:

1. Outline drawings of fixtures and poles indicating dimensions and principal features.

2. Electrical ratings and photometric data with certified results of independent laboratory tests.

C. Shop drawings from manufacturers detailing nonstandard fixtures and poles and indicating dimensions, weights, methods at field assembly, components, and accessories.

D. Foundation drawings: Provide structural drawings of poles foundation sealed by a registered Arizona structural engineer.

E. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 01.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70 “National Electrical Code” for components and installation.

B. Comply with ANSI C2, “National Electrical Safety Code”.

C. Listing and Labeling: Provide fixtures and accessories that are listed and labeled for their indicated use and location on the Project.

1. The Terms “Listed” and “Labeled”: As defined in the “National Electrical Code”, Article 100.

1.6 STORAGE AND HANDLING OF POLES

A. General: Store poles on decay-resistant treated skids at least 1 ft. above grade and vegetation. Support pole to prevent distortion and arrange to provide free air circulation.

B. Metal Poles: Retain factory-applied pole wrappings until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.7 EXTRA MATERIALS

A. Furnish extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels describing contents. Deliver extra materials to the Owner.

1. Lamps: 5 lamps for each 100 of each type and rating installed. Furnish at least 1 of each type.

2. Glass and Plastic Lenses, Covers, and Other Optical Parts: 1 for each 100 of each type and rating installed. Furnish at least 1 of each type.

3. Ballasts: 1 for each 100 of each type and rating installed. Furnish at least 1 of each type.

PART 2 – PRODUCTS

2.1 FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs and sharp edges and corners.

B. Sheet Metal Components: Corrosion-resistant aluminum, except as indicated. Form and support to prevent warping and sagging.

C. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed fixtures.

D. Doors, Frames, and Other Internal Access Provisions: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of

tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in the operating position. Provide for door removal for cleaning or replacing lens. Arrange for door opening to disconnect ballast.

E. Exposed Hardware Material: Stainless steel.

F. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Plastic Parts: Resistant to yellowing and other changes due to aging and exposure to heat and UV radiation.

H. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.

I. Photoelectric Relay: UL 773, “Plug-in, Locking Type Photocontrols for Use With Area Lighting”.

1. Contact Relays: Single-throw, arranged to fail in the “on” position and factory set to turn light unit on at 1.5 to 3 footcandles and off at 4.5 to 10 footcandles with 15 seconds minimum time delay.

2. Relay Mounting: In fixture housing.

2.2 FLUORESCENT FIXTURES

A. Fixtures: Conform to UL 1570, “Fluorescent Lighting Fixtures”.

B. Ballasts: Conform to UL 935, “Fluorescent-Lamp Ballasts”, certified by Electrical Testing Laboratory (ETL). Labeled by Certified Ballast Manufacturers Association (CBM).

1. Type: High-power-factor type rated for minus 20 deg C starting and listed for use in outdoor fixtures.

2. Sound Rating: A or B.

3. Voltage: Match connected circuits.

2.3 HIGH-INTENSITY-DISCHARGE (HID) FIXTURES

A. Fixtures: Conform to UL 1572, “High-Intensity-Discharge Lighting Fixtures”.

B. Ballasts: Conform to UL 1029, “High-Intensity-Discharge Lamp Ballasts” and ANSI C82.4, “Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)”. Provide constant wattage autotransformer (CWA) or regulating high-power-factor type, unless otherwise indicated.

1. Operating voltage matches system voltage.

2. Single-Lamp Ballasts: Minimum starting temperature of minus 30 deg C.

3. Construct ballasts so open circuit operation will not reduce the average life.

4. High-Pressure Sodium (HPS) Ballasts: Equipped with a solid-state ignitor/starter having an average life in the pulsing mode of 10,000 hours at an ignitor/starter case temperature of 90 deg C.

5. Noise: Uniformly quiet operation, with a noise rating of B or better.

2.4 INCANDESCENT LIGHTING FIXTURES

A. Conform to UL 1571, “Incandescent Lighting Fixtures”.

2.5 LED FIXTURES

A. Provide as shown on the drawings.

2.6 FIXTURE SUPPORT COMPONENTS

A. Wind-Load Strength: 100 mph and 1.3 gust factor for total support assembly, including pole, base, and anchorage, where used, to carry the fixtures, supports, and appurtenances at the indicated heights above grade without deflection or whipping.

B. Arm, Bracket, and Tenon Mount Materials: Match the poles.

C. Mountings, Fastenings, and Appurtenances: Corrosion-resistant components compatible with the poles and fixtures that will not cause galvanic action at contact points. Provide mountings that will correctly position the luminaire to provide the indicated light distribution.

D. Metal Pole Grounding Provisions: Welded ½-inch threaded lug, accessible through handhole.

E. Steel Mast Arms: Fabricated from 2-inch pipe, continuously welded to pole attachment plate and having span and rise as indicated.

F. Metal Pole Brackets: Designed to match pole metal. Provide cantilever brackets without underbrace, in the sizes and styles indicated, with straight tubular end section to accommodate the fixture.

G. Pole-Top Tenons: Fabricated to support the fixture indicated and securely fastened to the pole top.

2.7 LAMPS

A. Conform to ANSI Standards, C78 series, applicable to each type of lamp. Provide fixtures with indicated lamps. Where lamps are not indicated, provide lamps recommended by manufacturer.

2.8 FINISH

A. Metal Parts: Manufacturer’s standard finish except as otherwise indicated. Finish applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and similar defects. Remove poles, fixtures, and accessories showing evidence of corrosion or finish failure during Project warranty period and replace with new items.

B. Other Parts: Manufacturer’s standard finish except as otherwise indicated.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Set units plumb, square, level, and secure according to manufacturer's written instructions and shop drawings.

3.2 CONCRETE FOUNDATIONS

A. Construct concrete foundations with 3000-pound, 28-day concrete conforming to Division 03 Section "Cast-In-Place Concrete". Comply with details and manufacturer's recommendations for reinforcing anchor bolts, nuts, and washers.

B. Fixture Attachment: Fasten to indicated structural supports.

C. Fixture Attachment with Adjustable Features or Aiming: Attach fixtures and supports to allow aiming for indicated light distribution.

D. Lamp fixtures with indicated lamps according to manufacturer's instructions. Replace malfunctioning lamps.

3.3 GROUNDING

A. Ground fixtures and metal poles according to Division 26 Section "Grounding and Bonding for Electrical Systems."

1. Poles: Install 10-foot driven ground rod at each pole.

3.4 FIELD QUALITY CONTROL

A. Inspect installed units for damage.

B. Provide instruments to make and record test results.

C. Tests: Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source. Include the following:

1. Check for excessively noisy ballasts.

2. Photometric Tests: Measure light intensities at locations where specific illumination performance is indicated. Use photometers with calibration referenced to NIST standards.

3. Check for uniformity of illuminations.

4. Written report of tests indicating actual illumination results.

D. Replace or repair damaged and malfunctioning units and retest.

3.5 ADJUSTING AND CLEANING

A. Clean components on completion of installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 26 56 00

SECTION 26 60 00

UTILITY COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and supervisory requirements necessary for project coordination with all serving utilities companies providing power, telephone/data, and cable TV, including, but not necessarily limited to:

1. Coordination.
2. Administrative and supervisory personnel.
3. General installation provisions.

B. Include in the base contract price any and all utility company charges for service lines, utility relocations, and any other charges for service to this Project.

C. Payment of power company charges are included in this contract. If power company charges are not available at time of bidding, state clearly in the bid that these charges are not included or the allowance provided.

1.3 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection and operation.

1. Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

4. Installer shall notify local operating company in writing of telephone interface connection requirements to ensure proper and timely interfacing of building telecommunication systems with the operating company's systems.

5. Provide two (2) sets of construction drawing to each of the serving utilities area representatives within one (1) week of "Execution of Contract".

6. Information on the drawings is for general reference. Exact information and drawings for installation shall be obtained directly from the utility company.

7. Coordinate with other electrical work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of telephone system with other work.

8. Sequence installation of telephone system with other work to minimize possibility of damage and soiling during remainder of construction.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section “Submittals”.

B. Submit shop drawing of the Service Entrance Section and/or service equipment to the serving utility for their approval.

1.5 CODES AND STANDARDS:

A. Electrical Code compliance: Comply with applicable local code requirements of the authority having jurisdiction and the NEC.

B. Utilities Code and Standards: Comply with all applicable codes and standards of the serving utility.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Utility’s Instructions: Comply with the utility’s installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

B. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

C. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

END OF SECTION 26 60 00