XAVIER UNIVERSITY

STATE OF OHIO
M.H. MALTINSKY
1D1D6
REGISTERED ARCHITECTS

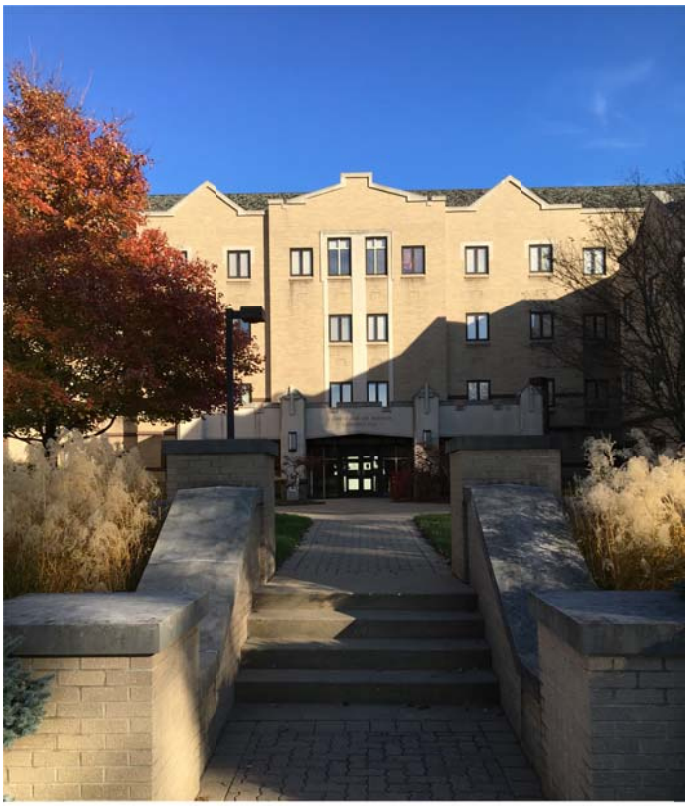
M.H. MALTINSKY, LICENSE #1D1D6
EXPIRATION DATE 12/31/2018

BUENGER HALL RENOVATION, PHASE 2

SPECIFICATIONS

CONSTRUCTION DOCUMENTS

03/21/2018



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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work under separate contracts.
3. Owner-furnished products.
4. Specification and drawing conventions.
5. Miscellaneous provisions.

1.2 PROJECT INFORMATION

A. Project Identification: Buenger Hall Renovation Phase 2.

1. Project Location: 3848 Saint Francis Xavier Way, Cincinnati, Ohio 45207..

B. Owner: Xavier University.

C. Architect: glaserworks, 304 East 8th Street, Cincinnati, Ohio 45202..

1.3 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work: Owner may award separate contract(s) for construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1.4 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

PART 2 - RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

PART 3 - SUMMARY

A. Section includes administrative and procedural requirements for alternates.

PART 4 - DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if School District Board decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

PART 5 - PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 6 - PRODUCTS (Not Used)

PART 7 - EXECUTION

PART 8 - SCHEDULE OF ALTERNATES

A. Alternate A-A1: Overlaid Roofing System:

1. In lieu of complete existing roof tear-off and re-roofing as described in Drawings and Specification Section 075423, Thermoplastic Polyolefin (TPO) Roofing, install overlaid roofing system comprising fully-adhered 80-mil TPO membrane on fully-adhered 1/2-inch HD coverboard over existing roofing system. Overlaid system to have 20-year system warranty.

B. Alternate A-A2: Alternate Furnishings:

1. In lieu of Basis-of Design Coffee Table T-20, provide and install alternate table as described in Section 126100 Furnishings, Appendix A Furnishings Specifications.

C. Alternate A-A3: Wireless Door Access Control:

1. Supply and install WiFi Card entry in lieu of card entry as indicated on Drawing Sheet A524 at hardware sets indicated on Drawing Sheet A524.

D. Alternate A-E1: Alternate Light Fixtures.

1. Provide pricing for 2’ x 2’ Columbia LZPT22-30MLG-LSRS-EDU; 2’ x 4’ Columbia LZPT24-30MLG-LSRS-EDU-ELL14 in place of fixture types “B” and “A”/”A2”, respectively. Price for a complete and operable system.

E. Alternate A-E2: Replace Lower Level Light Fixtures:

1. Remove existing industrial striplight fixtures in Lower Level mechanical/electrical and storage spaces as shown on drawings. Replace with 4-foot LED striplight fixtures utilizing existing conduit, wiring, circuits, and lighting controls. Provide 1400 lumen emergency driver accessory for all new striplight fixtures replacing existing emergency striplight fixtures.

END OF SECTION

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

B. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

C. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

D. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. Submit Product Data in the following format:

a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Submit Shop Drawings in the following format:

a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.

b. Product name and name of manufacturer.

E. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect .

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

END OF SECTION

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

C. Storage:

1. Store materials in a manner that will not endanger Project structure.

2. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

3. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

4. Protect stored products from damage and liquids from freezing.

1.4 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

3. Where products are accompanied by the term "as selected," Architect will make selection.

4. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Installation of the Work.
2. Cutting and patching.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect.

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

D. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

b. Restore damaged pipe covering to its original condition.

E. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

3.6 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Warranties.
3. Final cleaning.
4. Repair of the Work.

1.2 ACTION SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Submit list of incomplete items in the following format:

a. PDF electronic file. Architect will return annotated file.

1.5 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

END OF SECTION

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation manuals for systems, subsystems, and equipment.
2. Product maintenance manuals.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

A. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
2. One paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

PART 2 - PRODUCTS

2.1 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Operating standards.
3. Operating procedures.
4. Operating logs.
5. Wiring diagrams.
6. Control diagrams.
7. Piped system diagrams.
8. Precautions against improper use.
9. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

2.2 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

2.3 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

C. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

D. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.

2. Submit electronic files for shop drawings serving as record drawings.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an acceptable drawing technique.

c. Record data as soon as possible after obtaining it.

d. Record and check the markup before enclosing concealed installations.

e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.

b. Revisions to details shown on Drawings.

c. Revisions to routing of piping and conduits.

d. Revisions to electrical circuitry.

e. Actual equipment locations.

f. Duct size and routing.

g. Locations of concealed internal utilities.

h. Field records for variable and concealed conditions.

i. Record information on the Work that is shown only schematically.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

END OF SECTION

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

1.2 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.
2. Documentation: Review the following items in detail:
    a. Operations manuals.
    b. Maintenance manuals.

c. Identification systems.

d. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.

b. Instructions on stopping.

c. Shutdown instructions for each type of emergency.

d. Operating instructions for conditions outside of normal operating limits.

e. Sequences for electric or electronic systems.

f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.

b. Equipment or system break-in procedures.

c. Routine and normal operating instructions.

d. Regulation and control procedures.

e. Control sequences.

f. Safety procedures.

g. Instructions on stopping.

h. Normal shutdown instructions.

i. Operating procedures for emergencies.

j. Operating procedures for system, subsystem, or equipment failure.

k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.

m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.

b. Checking adjustments.

c. Noise and vibration adjustments.

d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.

b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.

b. Types of cleaning agents to be used and methods of cleaning.

c. List of cleaning agents and methods of cleaning detrimental to product.

d. Procedures for routine cleaning

e. Procedures for preventive maintenance.

f. Procedures for routine maintenance.

g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.

b. Repair instructions.

c. Disassembly; component removal, repair, and replacement; and reassembly instructions.

d. Instructions for identifying parts and components.

e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

END OF SECTION

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SECTION 040110 - MASONRY CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cleaning the following:

1. Unit masonry surfaces.
2. Stone surfaces.
3. Concrete surfaces.

B. Work in this Section is included in Alternate No. 4.

1.2 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi.

B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

1.3 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform masonry-cleaning work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
3. Clean masonry surfaces.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include material descriptions and application instructions.
2. Include test data substantiating that products comply with requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Cleaning program.

1.6 QUALITY ASSURANCE

A. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used; protection of surrounding materials; and control of runoff during operations. Include provisions for supervising worker performance and preventing damage.

1. If materials and methods other than those indicated are proposed for any phase of cleaning work, add a written description of such materials and methods, including evidence of successful use on comparable projects and demonstrations to show their effectiveness for this Project.

B. Mockups: Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Cleaning: Clean an area approximately 25 sq. ft. for each type of masonry and surface condition.

a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.

b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry-cleaning work to be performed according to product manufacturers' written instructions and specified requirements.

B. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least seven days after completion of cleaning.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Water: Potable.

B. Acidic Cleaner: Manufacturer's standard acidic masonry cleaner composed of hydrofluoric acid or ammonium bifluoride blended with other acids, detergents, wetting agents, and inhibitors.

1. Products: Subject to compliance with requirements, provide the following:

a. PROSOCO, Inc.; Enviro Klean SafRestorer.

b. Or an equivalent product by one of the following manufacturers:

1) EaCo Chem, Inc.

2) Hydrochemical Techniques, Inc.

PART 3 - EXECUTION

3.1 PROTECTION

A. Comply with manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

B. Remove downspouts and associated hardware adjacent to immediate work area and store during masonry cleaning. Reinstall when masonry cleaning is complete.

3.2 CLEANING MASONRY, GENERAL

A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 50 feet away by Architect.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Brushes: Do not use wire brushes.

2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.

a. Equip units with pressure gages.

b. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.

D. Perform additional general cleaning and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.

E. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.

1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

G. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.3 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing remaining growth to dry as long as possible before removal. Remove loose soil and plant debris from open joints to whatever depth they occur.

3.4 CLEANING MASONRY

A. Acidic Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.

2. Apply cleaner to surface by brush or low-pressure spray.
3. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer.
4. Rinse with cold water applied by medium -pressure spray to remove chemicals and soil. Rinse until all foaming, if any, stops and suds disappear.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

3.5 FINAL CLEANING

A. Clean adjacent non-masonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.

B. Remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

C. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION

SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Plastic-laminate-faced wall and ceiling panels at elevator cabs.
3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 123661.16 "Solid Surfacing Countertops."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

B. Grade: Custom.

C. Type of Construction: Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

E. Edge Construction: All door, drawer and exposed edges to be edge-banded with 0.12-inch thick (3mm) PVC matching laminate in color.

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Formica Corporation.

b. Nevamar Co.

c. Pionite

d. Wilsonart International; Div.of Premark International, Inc.

G. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.

2. Vertical Surfaces: Grade VGS.

3. Edges: Grade VGS.

H. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick (3mm), matching laminate in color, pattern, and finish.

b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade CLS.

2. Drawer Sides and Backs: Solid-hardwood lumber.

3. Drawer Bottoms: Hardwood plywood.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from laminate manufacturer's full range in the following categories:

a. Solid colors.

b. Wood grains.

c. Patterns.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.

2. Softwood Plywood: DOC PS 1, medium-density overlay.

3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Shelf Rests: BHMA A156.9, B04013; metal.

E. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.

2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.

3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.

4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.

5. For drawers more than 6 inches high or more than 24 incheswide, provide Grade 1HD-200.

F. Door and Drawer Silencers: BHMA A156.16, L03011.

G. Door and Drawer Locks (where indicated on drawing sheets): BHMA A156.11, E0712

H. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

2. Satin Stainless Steel: BHMA 630.

I. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.5 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

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SECTION 071900 - WATER REPELLENTS

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. Section includes penetrating water-repellent treatments for the following vertical and horizontal surfaces:

1. Cast-in-place concrete.
2. Clay brick masonry.
3. Natural stone.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

B. Mockups: Prepare mockups of each required water repellent on each type of substrate required to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 FIELD CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:

1. Concrete surfaces and mortar have cured for not less than 28 days.

2. Building has been closed in for not less than 30 days before treating wall assemblies.
3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
5. Rain or snow is not predicted within 24 hours.
6. Not less than seven days have passed since surfaces were last wet.
7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS

A. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 400 g/L or less of VOCs.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. PROSOCO, Inc.; Siloxane WB Concentrate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.

1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements.
2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
3. Verify that required repairs are complete, cured, and dry before applying water repellent.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. New Construction and Repairs: Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.

B. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions

C. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

D. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.

E. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply coating of water repellent on surfaces to be treated to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.

C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

B. Comply with manufacturer's written cleaning instructions.

END OF SECTION

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SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Roof insulation.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

B. Field quality-control reports.

C. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roofing, base flashings, roof insulation, cover boards, and other components of roofing system.

2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirments, provide Firestone Building Products or comparable product by one of the following:

1. GAF
2. Johns Manville
3. Tremco Roofing Systems.

B. Source Limitations: Obtain components including roof insulation for roofing system from same manufacturer as membrane roofing.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:

1. Corner Uplift Pressure: 60.0 lbf/sq. ft..
2. Perimeter Uplift Pressure: 39.8 lbf/sq. ft..
3. Field-of-Roof Uplift Pressure: 23.8 lbf/sq. ft..

D. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.3 TPO ROOFING

A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible TPO sheet.

1. Thickness: 80 mils, nominal.
2. Exposed Face Color: White.

1.4 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 60 mills thick, minimum, of same color as TPO sheet.

C. Bonding Adhesive: Manufacturer's standard.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.

F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

1.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured by TPO roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

1.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

C. Cover Board: ASTM C 1289, Type II, Class 4, Grade 2, polyisocyanurate insulation board, 1/2 inch thick.

1.7 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads .

1. Basis-of-Design Product: Subject to compliance with requirements, provide Firestone Building Products; X-Tred Walkway Pad.

a. Size: 30inches wide by 30 feet long.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

2.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

2.4 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together.

2.5 ADHERED ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

2.6 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

2.7 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate according to roofing system manufacturer's written instructions.

2.8 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

2.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

2.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: .
2. Address: .
3. Building Name/Type: .
4. Address: .
5. Area of Work: .
6. Acceptance Date: _____.
7. Warranty Period: 2 years.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    a. lightning;
    b. peak gust wind speed exceeding 105 mph;
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.

2. Name: _____.

3. Title: _____.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed low-slope roof sheet metal fabrications.
3. Formed equipment support flashing.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:

a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: Match existing.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long sections. Furnish with 6-inch- wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- wide, exposed cover plate.
2. Fabricate from the Following Materials:

    a. Galvanized Steel: 0.028 inch thick.

B. Counterflashing: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch thick.

C. Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.

2.6 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

3.4 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.

B. Related Sections:

1. Divisions 21 through 28 for mechanical, electrical, plumbing and fire protection penetrations requiring firestopping.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.

b. Classification markings on penetration firestopping correspond to designations listed by the following:

1) UL in its "Fire Resistance Directory."

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hilti, Inc.
2. 3M Fire Protection Products.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Fire-resistance-rated walls include fire walls fire-barrier walls and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

2.3 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's name, address, and phone number.

3. Designation of applicable testing and inspecting agency.

4. Date of installation.

5. Manufacturer's name.

6. Installer's name.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION

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SECTION 079200 - JOINT SEALANTS

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. Section Includes:

1. Silicone joint sealants.
2. Latex joint sealants.
3. Acoustical joint sealants.

B. Related Requirements:

1. Division 07 Section "Fire-Resistive Joint Systems fore sealing joints in fire-resistance-rated construction.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Manufacturers: Subject to compliance with requirements, manufacturers include, but are not limited to, the following:

F. Dow Corning Corporation.

G. GE Advanced Materials.

H. Percora Corporation.

I. Tremco Corporation.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

B. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

C. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

D. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

2.3 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90. Sealant shall have a VOC content of 250 g/L or less.

2.5 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type O (open-cell material), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.
4. Provide recessed joint configuration of recess depth and at according to Figure 8C in ASTM C1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint Locations:

B. Joint-Sealant Application J-1: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Construction joints in cast-in-place concrete.
   b. Control and expansion joints in unit masonry.
   c. Joints between metal panels.
   d. Joints between different materials listed above.
   e. Perimeter joints between materials listed above and frames of doors windows and louvers.
   f. Other joints as indicated or required.

2. Joint Sealant: Silicone, nonstaining, single component, nonsag, nontraffic grade, neutral curing, Class 50.

C. Joint-Sealant Application J-2: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

   a. Isolation joints in cast-in-place concrete slabs.
   b. Other joints as indicated or requried.

2. Joint Sealant: Silicone, single component, nonsag, traffic grade, neutral curing, Class 100/50.

D. Joint-Sealant Application J-3: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Perimeter joints of of exterior openings where indicated.

   b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances..
   c. Other joints as indicated or required.

2. Joint Sealant: Latex.

E. Joint-Sealant Application J-4: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated or required.

2. Joint Sealant: Silicone, mildew resistant, single component, nonsag, neutral curing.

F. Joint-Sealant Application J-5: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Acoustical joints where indicated or required to meet acoustical performance of assemblies.
b. Other joints as indicated or required.

2. Joint Sealant: Acoustical.

END OF SECTION

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft..

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM AASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
3. Protective Coating for Framing Members within Roof, Exterior Walls and Exterior Soffits: ASTM AASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.

B. Studs and Runners: ASTM C645. Use either steel studs and runners or embossed steel studs and runners.

1. Steel Studs and Runners or Embossed Steel Studs and Runners:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) CEMCO; California Expanded Metal Products Co.
2) ClarkDietrich Building Systems
3) Marino WARE
4) MBA Building Supplies.
5) MRI Steel Framing, LLC.

6) USG Corporation

b. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection but no less than indicated on Drawings.

c. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

2. Double-Runner System: ASTM C645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) CEMCO; California Expanded Metal Products Co.; CST SLP-TRK Slotted Deflection Track.

2) ClarkDietrich Building Systems; SLP-TRK Slotted Deflection Track.

3) Superior Metal Trim; SFT

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0329 inch.

E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings but not less than 1-1/2 inches.

2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Minimum Base-Metal Thickness: 0.0329 inch.

2. Depth: As indicated on Drawings.

G. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.

2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.

3. Tie Wire: ASTM A641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

B. Wire Hangers: ASTM A641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: 1-1/2 inchesunless indicated otherwise.

D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.

2. Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0329 inch.

b. Depth: 1-5/8 inchesunless indicated otherwise.

3. Embossed Steel Studs and Runners: ASTM C645.

a. Minimum Base-Metal Thickness: 0.0190 inch.

b. Depth: 1-5/8 inchesunless otherwise indicated.

4. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.

a. Minimum Base-Metal Thickness: 0.0329 inch.

E. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc; Drywall Grid Systems.

b. Chicago Metallic Corporation; SpanFast Drywall Ceiling Suspension Systems.

c. United State Gypsum Company; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
3. Tile Backing Panels: [As required by horizontal deflection performance requirements] [16 inches o.c.] unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

E. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c. unless otherwise indicated .
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 incheso.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.
4. Metal trim and accessories.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Georgia-Pacific Gypsum LLC.
2. Lafarge North America Inc.
3. National Gypsum Company.
4. USG Corporation.

B. Gypsum Wallboard: ASTM C1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

E. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.

1. Core: 5/8 inch, Type X.
2. Surface Abrasion: ASTM C1629/C 1629M, meets or exceeds Level 2 requirements.
3. Indentation: ASTM C1629/C 1629M, meets or exceeds Level 2 requirements.
4. Soft-Body Impact: ASTM C1629/C 1629M, meets or exceeds Level 2 requirements.
5. Long Edges: Tapered.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Exterior Gypsum Soffit Board: ASTM C1396/C 1396M, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Continental Building Products, LLC.
b. Georgia-Pacific Building Products.
c. National Gypsum Company.
d. United States Gypsum Company.

2. Core: 5/8".

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Custom Building Products.
b. James Hardie Building Products, Inc.
c. National Gypsum Company.
d. United States Gypsum Company.

2. Thickness: 5/8 inch .
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. L-Bead: L-shaped; exposed long flange receives joint compound.
d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
e. Expansion (control) joint. Maximum 30 feet o.c.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
    a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: As indicated on Drawings.

2. Abuse-Resistant Type: On exposed surfaces of walls.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM CASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use where indicated.

3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

a. Primer and its application to surfaces are specified in Division 09 Section "Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

B. Related Requirements:

C. Division 09 Section "Non-Structural Metal Framing for suspension systems for gypsum board ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of 6-inch- square Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling and ceiling-mounted items including the following:
    a. Lighting fixtures.
    b. Diffusers.
    c. Grilles.
    d. Speakers.
    e. Access panels.
    f. Perimeter moldings.
5. Minimum Drawing Scale: 1/8 inch = 1 foot.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size panels in full cartons equal to 20 tiles minimum.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E1264.
2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries; School Zone Fine Fissured High NRC/High CAC (no. 1719) or comparable product by one of the following:

1. CertainTeed Corporation.
2. United States Gypsum Company.

B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Classification: Provide panels as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
2. Pattern: CE (perforated, small holes and lightly textured) .

D. Color: White.

E. Light Reflectance (LR): Not less than 0.85.

F. Ceiling Attenuation Class (CAC): Not less than 40.

G. Noise Reduction Coefficient (NRC): Not less than 0.70.

H. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.

I. Thickness: 3/4 inch.

J. Modular Size: 24 by 24 inches.

2.4 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries;Suprafine XL 9/16" Exposed Tee or comparable product by one of the following:

1. CertainTeed Corporation.
2. United States Gypsum Company.

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 9/16-inch- wide metal caps on flanges.

1. Structural Classification: Intermediate or Heavy-duty system as determined my suspension system manufacturer based on loading.
2. Face Design: Flat, flush.
3. Cap Material: Cold-rolled steel.
4. Cap Finish: Painted white .

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM CASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.

C. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

D. Hold-Down Clips: Manufacturer's standard hold-down.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries or comparable product by one of the following:

1. CertainTeed Corporation.
2. United States Gypsum Company.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C636/C 636M, manufacturer's written instructions, and CISCA's "Ceiling Systems Handbook".

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

8. Do not attach hangers to steel deck tabs.

9. Do not attach hangers to steel roof deck. Attach hangers to structural members.

10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. Arrange directionally patterned acoustical panels as follows:

a. As indicated on reflected ceiling plans.

2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

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. SUMMARY

C. Section Includes:

1. Thermoplastic-rubber base.
2. Rubber stair accessories.
3. Rubber molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials[, from the same product run,] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 15 for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE (RB, RB-1 &1A, RB-2 & 2A, RB-3 & 3A, RB-4 & 4A)

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Johnsonite; A Tarkett Company.

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient floor coverings.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Colors: As selected by architect from manufacturer's full range.

2.2 RUBBER STAIR ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Roppe Corporation, USA.

B. Stair Treads: ASTM F 2169.

1. Class: 1 (smooth, flat).
2. Group: 2 (with contrasting color for the visually impaired).
3. Nosing Style: To fit existing steps.
4. Nosing Height: 1-1/2 inches.
5. Thickness: 1/4 inch and tapered to back edge.
6. Size: Lengths and depths to fit each stair tread in one piece.

C. Separate Risers: Smooth, flat; in height that fully covers substrate; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

1. Thickness: Manufacturer's standard.

D. Landing Tile: Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

E. Rubber Base (RRB): Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads and landing tile.

F. Locations: Flooring within stair enclosure, including top, intermediate, and bottom landings all stairs.

G. Colors and Patterns: As selected by architect from manufacturer's full range.

2.3 RUBBER MOLDING ACCESSORY

A. Description: Rubber carpet bar for tackless installations, carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, joiner for tile and carpet transition strips.

B. Locations: Where required to protect floor finish edges where no other transitions are provide by other Sections.

C. Colors and Patterns: As selected by architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

    a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

    a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

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SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl composition floor tile.

B. Related Sections:

1. Division 09 Section "Resilient Base and Accessories."
2. Division 09 Section "Tile Carpeting."
3. Division 09 Section “Sheet Carpeting.”

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of floor tile indicated.

C. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE (VCT, VCT-1, VCT-2, VCT-3, VCT-4)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries; Standard Excelonor comparable product by one of the following:

1. Johnsonite/Tarkett Group.

2. .Mannington Mills, Inc.

B. Tile Standard: ASTM F 1066 Class 2, through-pattern .

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns:

1. Field color: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content:

a. Vinyl Composition Tile Adhesives: 50 g/L or less.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern) and in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.

2. Sweep and vacuum surfaces thoroughly.

3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

E. Cover floor tile until Substantial Completion.

END OF SECTION

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes modular carpet tile.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

C. Samples for Initial Selection: For each type of carpet tile.

D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.8 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.9 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:
    a. More than 10 percent edge raveling, snags, and runs.
    b. Dimensional instability.
    c. Excess static discharge.
    d. Loss of tuft-bind strength.
    e. Loss of face fiber.
    f. Delamination.
3. Warranty Period: 10 years from date of Substantial Completion..

PART 2 - PRODUCTS

2.1 CARPET TILE (CPT-1)

A. Subject to compliance with requirements, provide Shaw Contract Group; Relief Tile in Vertical Layers Collection.

B. Style: 5T152

C. Color: As selected by Architect from manufacturer's full range.

D. Fiber Content: 100 percent nylon 6, 6.

E. Density: 6638 oz./cu. yd.

F. Pile Thickness: 0.141 inches for finished carpet tile according to ASTM D6859.

G. Stitches: 9 stiches per inch.

H. Gage: 1/12 .

I. Total Weight: 26 oz./sq. yd. for finished carpet tile.

J. Primary Backing/Backcoating: Manufacturer's standard composite materials .

K. Secondary Backing: Manufacturer's standard material.

L. Size: 9 by 36 inches.

M. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.

2.2 CARPET TILE (CPT-3)

A. Subject to compliance with requirements, provide Shaw Contract Group; Expose Tile in Vertical Layers Collection.

B. Style: 5T151

C. Color: Plaster, no. 50535

D. Fiber Content: 100 percent nylon 6, 6.

E. Density: 6085 oz./cu. yd.

F. Pile Thickness: 0.142 inches for finished carpet tile according to ASTM D6859.

G. Stitches: 9 stiches per inch.

H. Gage: 1/12 .

I. Total Weight: 24 oz./sq. yd. for finished carpet tile.

J. Primary Backing/Backcoating: Manufacturer's standard composite materials .

K. Secondary Backing: Manufacturer's standard material.

L. Size: 9 by 36 inches.

M. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

1. VOC Content: 50 g/L or less.

PART 3 - EXECUTION

3.1 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 carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "CRI Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns :

E. Pattern: Ashlar.

F. Cut and fit carpet tile 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 tile manufacturer.

G. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

I. Install pattern parallel to walls and borders. Verify orientation of pattern with Architect prior to installation.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "CRI Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

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SECTION 096816 - SHEET CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Tufted carpet.
2. Carpet cushion.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.
2. Section 096813 "Tile Carpeting" for modular carpet tiles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics and durability.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet: 12-inch- square Sample.
2. Carpet Cushion: 6-inch- square Sample.

C. Samples for Initial Selection: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.

2. Precautions for cleaning materials and methods that could be detrimental to carpet[and carpet cushion].

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.

1.6 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Do not install carpet and carpet cushion over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

1.7 WARRANTY

A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

    a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
    b. Loss of tuft bind strength.
    c. Excess static discharge.
    d. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

B. Special Warranty for Carpet Cushion: Manufacturer agrees to repair or replace components of carpet cushion installation that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TUFTED CARPET (CPT-2)

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Shaw Contract Group; a Berkshire Hathaway company.

B. Collection: Quite Canvas.

C. Style: sentiment no. 60775.

D. Color: As selected by Architect from manufacturer's full range.

E. Fiber Content: 100 percent nylon.

F. Pile Characteristic: Cut pile.

G. Stitches: <11 stitches per inch>.

H. Total Weight: <25 oz./sq. yd.> for finished carpet.

I. Primary Backing: polypropylene.

J. Secondary Backing: Manufacturer's standard material.

K. Applied Treatments:

1. Applied Soil-Resistance Treatment: Manufacturer's standard material.

2.2 CARPET CUSHION

A. Shaw HP200 Duratch V Plus Cushion, 0.25-inch thick, 14 lbs. density.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

1. VOC Content: 50 g/L or less.

C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI's "CRI Carpet Installation Standard."

D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 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 carpet performance.

B. Examine carpet for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

3.2 PREPARATION

A. General: Comply with CRI's "CRI Carpet Installation Standard" and with carpet manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive, carpet, and carpet cushion manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 CARPET INSTALLATION

A. Comply with CRI's "CRI Carpet Installation Standard" and carpet and carpet cushion manufacturers' written installation instructions for the following:

1. Stretch-in installation.

B. Comply with carpet manufacturer's written instructions and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

1. Stretch-in Carpet Installation: Install carpet cushion seams at 90-degree angle with carpet seams.

C. Install pattern parallel to walls and borders.

D. 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.

E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI's "CRI Carpet Installation Standard."

END OF SECTION

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SECTION 099123 – PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior and exterior substrates as scheduled in the Room Finish Schedule and shown in the Drawings:

1. CMU.
2. Steel.
3. Gypsum board.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.3 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each interior paint system specified in Part 3.
    a. Vertical and Horizontal Surfaces: Provide samples of at least 50 sq. ft..
    b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
    a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not paint over UL, FMG or other code-required labels or equipment name, identification, performance rating or nomenclature plates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Products listed in the Schedules are from PPG Paints.

B. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.

2. PPG Paints.

3. Pratt & Lambert Paints

4. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Material Quality: Provide manufacturer’s factory formulated best-quality paint materials of coating types specified. Paint material containers not displaying manufacturer’s product identification will not be acceptable.

1. VOC Content: Products shall comply with the lower VOC limit specified in OBBC or other authorities having jurisdiction.

C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Cementitious Materials: Prepare concrete surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."

2. SSPC-SP 3, "Power Tool Cleaning."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces and as scheduled:
    a. Equipment, including panelboards.
    b. Uninsulated metal piping.
    c. Uninsulated plastic piping.
    d. Pipe hangers and supports.
    e. Metal conduit.
    f. Plastic conduit.
    g. Ductwork and hangers.
    h. Diffusers, grilles and registers not matching exposed ceiling color.
    i. Other visible equipment including pipe insulation having a paintable jacket material.
    j. Metal decking and steel framing.
    k. Floating ceiling suspension systems.
    l. Access doors and frames.
    m. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Ferrous Metal Surfaces – 3-Coat Latex System, Semi-Gloss Finish:

1. Primer: Reference Division 5 Sections.

2. Spot Primer: Direct to metal acrylic emulsion waterborne primer / finish.

a. Product: Pitt Tech Plus 90-912 DTM Primer Finish. 3 -4 mils DFT / coat

3. (2) Finish Coats: DTM Water based Finish.

a. Product: PittTech Plus 90-1210 DTM Semi-Gloss Finish. 3 -4 mils DFT / coat.

4. Surfaces: As scheduled and including but not limited to structural steel, hollow metal doors and frames and miscellaneous steel.

B. CMU Wall Surfaces - 3-Coat latex Acrylic, Eggshell Finish:

1. Block filler: 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler, 6 - 12.5 mils DFT.

2. (2) Finish Coats: 6-4310XI SpeedHide Interior Zero VOC Eggshell Latex, 1.4 mils DFT / coat.

C. Gypsum Board Ceiling Surfaces - 3-Coat Latex Acrylic, Flat Finish:

1. Primer: High build drywall surfacer, spray application

a. Product: Speedhide 6-1 MaxBuild High Build Surfacer, 7 - 9 mils DFT / coat.

2. (2) Finish Coats: Low-Odor/VOC Latex.

a. Product: Speedhide 6-4110 Zero VOC Interior Flat latex 1.3 mils DFT / coat.

3. Surfaces: Gypsum board ceiling surfaces.

D. Gypsum Board Wall Surfaces - 3-Coat Latex Acrylic, Eggshell Finish:

1. Primer: High build drywall surfacer, spray application.

a. Product: Speedhide 6-1 MaxBuild High Build Surfacer, 7 - 9 mils DFT / coat.

2. (2) Finish Coats: Institutional Low-Odor/VOC Latex.

a. Product: Speedhide 6-4310 Zero VOC Interior Eggshell latex 1.4 mils DFT / coat.

3. Surfaces: Gypsum board wall surfaces subject to moderate abuse.

E. Gypsum Board Wall Surfaces - 3-Coat Acrylic Epoxy, Semi-Gloss Finish:

1. Primer: High build drywall surfacer, spray application.

a. Product: Speedhide 6-1 MaxBuild High Build Surfacer, 7 - 9 mils DFT / coat.

2. (2) Finish Coats: High performance pre catalyzed water based epoxy.

a. Product: Pittglaze 16-510 Pre CatalyzedAcrylic Epoxy Semi-Gloss. 2 -3 mils DFT / coat.

3. Surfaces: Gypsum board wall surfaces in mechanical service areas and other areas as directed.

3.7 EXTERIOR PAINT SCHEDULE

A. Galvanized Metal - 3 Coat Acrylic System, Semi-Gloss Finish:

1. Primer: Allow new galvanized surfaces to weather six months min or treat with Galvaprep solution, or similar treatment, per manufacturer’s directions prior to primer application.

a. Product: Pitt Tech Plus 90-912 DTM Primer Finish. 3 -4 mils DFT / coat.

2. (2) Finish Coats:

a. Product: PittTech Plus 90-1210 DTM Semi-Gloss Finish. 3 -4 mils DFT / coat.

3. Surfaces: Exterior galvanized surfaces and other misc. exterior steel indicated to be painted.

END OF SECTION

SECTION 10 11 00 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Porcelain enamel markerboards.
2. Tackboards.
3. Accessories.

1.3 QUALITY ASSURANCE

A. All marker boards shall comply with Porcelain Enamel Institute's specifications.

B. Installer Qualifications: An authorized representative of motor-operated, sliding visual display unit manufacturer for installation and maintenance of units required for this Project.

C. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display surfaces and are based on the specific system indicated.

E. Fire-Test-Response Characteristics: Provide materials with the surface-burning characteristics for Class C, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.4 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show location of panel joints.
2. Include sections of typical trim members.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for surface-burning characteristics of vinyl fabrics.

C. Qualification Data: For Installer.

D. Maintenance Data: For visual display surfaces to include in maintenance manuals.

E. Warranties: Special warranties specified in this Section.

1.5 WARRANTY

A. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.

1. Warranty Period: 50 years from date of Contract Completion for markerboards.

PART 2 - PRODUCTS

2.1 Manufacturers:

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Egan Visual Inc.
2. Ghent Manufacturing, Inc.
3. Marsh Industries, Visual Products Group.

2.2 MARKERBOARDS

A. Porcelain Enamel Markerboards: Balanced, high-pressure-laminated, porcelain enamel boards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: LG24 low gloss 24-gauge enameling grade steel especially processed for temperatures used in coating porcelain on steel and allowing magnetic attachments. Coat exposed face and edges with a 3-coat process consisting of primer, ground coat, and color cover coat. Coat concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at manufacturer's standard firing temperatures, but not less than 1200 deg F . Color: Bright white.
2. Core: 7/16 inches Duracore.
3. Panel Backing: 0.005 inch aluminum.
4. Laminations: Shall be hot-type neoprene contact adhesive applied to both surfaces automatically. Each substrate to have a minimum of 80% covering with 1.5-2.0 dry mils of adhesive. Panel components shall have uniform pressure applied mechanically over entire area. Laminations shall be made by face sheet manufacturer.
5. Metal Trim: Trim shall be heavy gauge extruded aluminum and shall meet or exceed ASTM B221 Alloy Standards. Finish to be etched and anodized satin finish.
    a. Chalk tray: Box type: Standard continuous, solid type aluminum chalk tray with ribbed section and injection molded and closures.

2.3 TACKBOARDS

A. Plastic-Impregnated Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout with surface-burning characteristics indicated.

1. Trim: Factory applied anodized extruded aluminum.

2.4 ACCESSORIES

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-(1.57-mm-) thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
2. Field-Applied Trim: Manufacturer's standard snap-on trim with no visible screws or exposed joints.
3. Map Rail: Furnish map rail at top of each Marker Board unit with natural cork insert, complete with the following accessories:
    a. End Stops: Provide one end stop at each end of map rail.
    b. Map Hooks: Provide 2 map hooks with flexible metal clips for every 48 inches of map rail or fraction thereof.
4. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
5. Provide manufacturer's standard vertical joint system between abutting sections of markerboards.
6. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards.

2.5 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.

B. Examine walls and partitions for proper backing for visual display surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, and substances that will impair bond between visual display boards and surfaces.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Field-Assembled Visual Display Units: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY UNITS

A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

3.5 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION

SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Room-identification signs, including signs with cork messaging panels.

1.2 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 SIGNS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASI Sign Systems, Inc.
2. Sizes: As indicated.

B. Interior Signs : Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: ASI Sign Systems, Inc.; InTouch ADA-Ready Sign System.
2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic backing sheet to produce composite sheet.

a. Color(s): As selected by Architect from manufacturer's full range.

3. Sign-Panel Perimeter: Finish edges smooth.

a. Edge Condition: Beveled.

b. Corner Condition in Elevation: As indicated.

4. Frame for cork panel: Aluminum.

a. Profile: Square.

b. Corner Condition in Elevation: Square.

c. Finish and Color: As selected by Architect from manufacturer's full range.

5. Mounting: Surface mounted to wall with adhesive and two-face tape .

2.3 PANEL-SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

2.4 ACCESSORIES

A. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Install signs so they do not protrude or obstruct according to the accessibility standard.

3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated andaccording to accessibility standard.

C. Mounting Methods:

1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

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SECTION 102113 - TOILET COMPARTMENTS

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. Section Includes:

1. Reinforced stainless-steel toilet compartments configured as toilet enclosures and urinal screens.

B. See drawings for description of enameled steel urinal screen located in Room no. 134.

C. See drawings for Owner-supplied accessories attached to toilet compartments.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.
3. Show locations of centerlines of toilet fixtures.
4. Show overhead support or bracing locations.

C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for units, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

B. Warranty: Manufacturer's standard 5 year warranty for replacement of product due to material defects or workmanship.

1.5 QUALITY ASSURANCE

A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

C. Regulatory Requirements: Comply with applicable provisions in ICC/ANSI A117.1 and 2011 OBC for toilet compartments designated as accessible.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.

B. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

C. Stainless-Steel Castings: ASTM A 743/A 743M.

2.2 STAINLESS-STEEL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Accurate Partitions Corporation.
2. General Partitions Mfg. Corp.
3. Hadrian Manufacturing Inc.

B. Toilet-Enclosure Style: Overhead braced.

C. Urinal-Screen Style: Wall hung flat panel.

D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to reinforced 6mm masonite on 1/2" honeycomb core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Provide with no-sightline system. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) for doors and panels and 1-1/4 inches (32 mm) for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

E. Urinal-Screen Construction:

1. Flat-Panel Urinal Screen: Matching panel construction.

F. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:

1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch (0.95 mm).
2. Panels: Manufacturer's standard thickness, but not less than 0.031 inch.
3. Doors: Manufacturer's standard thickness, but not less than 0.031 inch.
4. Flat-Panel Urinal Screens: Thickness matching the panels.

G. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

H. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

I. Stainless-Steel Finish: Manufacturer's standard textured "embossed" finish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Stainless steel.

2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position.

3. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.

5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.

6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.

b. Panels and Walls: 1 inch.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written

instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 102116.20 - SOLID SURFACE SHOWER UNITS

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. Section includes:

1. Solid surface shower receptors and wall and ceiling panels.
2. Solid surface shower accessories and related fabrications.

B. Related Sections include the following:

1. Section 079200: Sealants installed at joints with other work.
2. Section 102800: Toilet and bath accessories not specified in this Section.
3. Section 123661.16: Solid surface countertops.
4. Division 22: Plumbing fittings and fixtures.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking and other related units of work specified in other sections to ensure units can be installed as indicated.

B. Comply with manufacturer recommendations for installation sequence, including components by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer’s product data for each type of product specified.

B. Shop Drawings: Include plans, sections and details. Show relationship of products to wall framing, blocking in walls, wall finishes, and plumbing rough-ins.

C. Samples for Initial Selection:

1. Manufacturer’s full line of color samples for selection.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data

1.6 QUALITY ASSURANCE

A. Standard ANSI/ICPA SS 1 for solid surface material.

B. 2010 ADA Standards for Accessible Design and ICC/ANSI A117.1 for accessibility.

1.7 DELIVERY, STORAGE AND HANDLING

A. Do not deliver solid-surface products until substrates have been prepared for installation.

B. Store and protect products as indicated by manufacturer's written instructions.

1.8 PROJECT CONDITIONS

A. Field Measurements: Measure in-place and existing construction as needed for fabrication and execution. No changes to Contract Sum or Contract Time will be allowed for differences between Drawing dimensions and field measurements.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Manufacturer:Subject to compliance with the requirements, provide products by Endurant Washroom Systems, a subsidiary of Inpro Corporation or comparable products by one of the followintg :

1) Swan Corporation (The).
2) Tower Industries.

2.2 SHOWER UNITS

A. See Plumbing Drawings and Specifications for fittings and other components required for complete, functioning shower units.

B. Roll-in Shower Units:

1. Roll-in modular cast shower receptor, with maximum 2-degree positive slope toward drain.
2. ADA-compliant threshold.
3. Manufacturer's standard stepped, double-water barrier receptor edge.

4. Manufacturer's standard brass, no caulk drain and strainer with custom offset drain outlet locations to accommodate the existing drain locations.
5. Shower Floor with non-skid surface.
6. Solid Surface Wall Panels: Manufacturer’s standard 0.25-inch thick solid surface wall panel system matched to the receptor size.
7. Solid Surface Ceiling Panels: Manufacturer's standard cast 0.25-inch thick solid surface ceiling panel.
8. Inside corner trim: Manufacturer's standard, adhesive applied wedge-shaped solid surface trim.
9. Provide outside corner and other trim pieces as indicated on Drawings and as necessary for a complete, finished installation.
10. Manufacturer's standard, large, surface-mount corner shower caddy.
11. ADA-compliant compressible threshold / water dam.
12. Color: To be selected from manufacturer's standard Group A/A1 colors.

C. Standard Shower Units:

1. Modular cast shower receptor, with maximum 2-degree positive slope toward drain.
2. Full threshold.
3. Manufacturer's standard stepped, double-water barrier receptor edge.
4. Manufacturer's standard brass, no caulk drain and strainer with custom offset drain outlet locations to accommodate the existing drain locations.
5. Shower Floor with non-skid surface.
6. Solid Surface Ceiling Panels: Manufacturer's standard cast 0.25-inch thick solid surface ceiling panel.
7. Inside corner trim: Manufacturer's standard, adhesive applied wedge-shaped solid surface trim.
8. Provide outside corner and other trim pieces as indicated on Drawings and as necessary for a complete, finished installation.
9. Manufacturer's standard, large, surface-mount corner shower caddy.
10. Color: To be selected from manufacturer's standard Group A/A1 colors.

2.3 SOLID SURFACE FABRICATIONS

A. Solid surface ramp to maintain ADA threshold compliance in shower installations where accessible threshold cannot be suitable recessed into existing floor construction :

1. Solid surface ramp cut to fit wall-to-wall with width adjusted to achieve ADA compliance set in place with silicone adhesive.
2. Color: To be selected from manufacturers standard Group A/A1 color selections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before shower installation.

B. Examine walls and floors for suitable conditions where showers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble shower components according to manufacturers' written instructions.

B. Install showers level and plumb according to roughing-in drawings.

C. Set shower receptors in leveling bed of cement grout per manufacturer's recommendations.

D. Install ceiling panels prior to installing wall panels.

E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheons requirements specified in Division 22.

F. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 ADJUSTING

A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

A. After completing installation of showers, inspect and repair damaged finishes. If work cannot be acceptably repaired, as determined by Architect and Owner, replace defective work.

B. Clean showers, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of showers for temporary facilities unless approved in writing by Owner.

END OF SECTION

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SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

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. Section Includes:

1. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Private-use bathroom accessories.

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Materials: As indicated on drawings.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Waste Receptacle TA125:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick, Inc.; model no. B-277 or comparable product by one of the following:

    a. A&J Washroom Accessories, Inc.
    b. American Specialties, Inc.; ASI Group.
    c. Bradley Corporation.

2. Mounting: Surface mounted .
3. Minimum Capacity: 12.75 gal.
4. Material and Finish: Stainless steel, No. 4 finish (satin).
5. Liner: Reusable vinyl liner.

C. Grab Bar TA 110 (18"), TA111 (24"), TA112 (36"), TA113 (42"):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick, Inc.; B-6806 or comparable product by one of the following:

    a. A&J Washroom Accessories, Inc.
    b. American Specialties, Inc.; ASI Group.
    c. Bradley Corporation.

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

    a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings .

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

A. Source Limitations: Obtain public-use shower room accessories from single source from single manufacturer.

B. Folding Shower Seat TA130:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick, Inc.; Model no. B-5191 or comparable product by one of the following:

    a. A&J Washroom Accessories, Inc.
    b. American Specialties, Inc.; ASI Group.
    c. Bradley Corporation.

2. Configuration: Rectangular seat.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
5. Dimensions: Seat approximately 18" wide x 14.5" deep.

2.4 PRIVATE-USE BATHROOM ACCESSORIES

A. Source Limitations: Obtain private-use bathroom accessories from single source from single manufacturer.

B. Toilet Tissue Dispenser TA101:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick, Inc., model no. B-6857 or comparable product by one of the following:

    a. American Specialties, Inc.; ASI Group.
    b. A & J Washroom Accessories, Inc.
    c. Bradley Corporation.

2. Description: Single-roll dispenser.
3. Mounting: Surface mounted.
4. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Shower Curtain Rod TA120:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick, Inc., model no. B-6047 or comparable product by one of the following:

    a. American Specialties, Inc.; ASI Group.
    b. A & J Washroom Accessories, Inc.
    c. Bradley Corporation.

2. Outside Diameter: 1-1/4 inches.
3. Mounting: Flanges with concealed fasteners.
4. Rod Material and Finish: Stainless steel, No. 4 finish (satin) .
5. Flange Material and Finish: Stainless steel, No. 4 finish (satin).
6. Accessories: Integral chrome-plated brass glide hooks.
7. Length: Sized to fit shower / tub enclosure.

D. Towel Bar TA115 and TA116:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick, Inc., model no. B-530 or comparable product by one of the following:

    a. American Specialties, Inc.; ASI Group.
    b. A & J Washroom Accessories, Inc.
    c. Bradley Corporation.

2. Description: 1-inch round tube .
3. Mounting: Flanges with concealed fasteners.
4. Length: 18 inches (TA115), 30 inches (TA116).
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.5 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

C. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Do not attach any accessory directly to solid surface materials at showers. Install according to solid surface and accessory manufacturers' written instructions.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

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SECTION 102819 - TUB AND SHOWER ENCLOSURES

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. Section includes framed shower doors and enclosures.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for shower doors and enclosures.

B. Shop Drawings: For tub and shower doors and enclosures.

1. Include plans, elevations, sections, and attachment details.

C. Samples for Initial Selection: For each type of exposed finish.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tub and shower doors and enclosures to include in maintenance manuals.

1.5 FIELD CONDITIONS

A. Verify dimensions by field measurements before fabrication and indicate on Shop Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of tub and shower doors and enclosures that fail in materials or workmanship within specified warranty period, without monetary limitation.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection.
b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FRAMED ENCLOSURES

A. Glass panels with full perimeter frames of extruded aluminum with screw-fastened corners. Minimum 0.375-inch penetration of glass into frame. Framing members of thickness required to support imposed loads.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Alumax Bath Enclosures.
b. American Shower Door.
c. Basco, Inc.
d. Cardinal Shower Enclosures; Hoskin & Muir, Inc.

B. Frames, Hardware, and Trim: Manufacturer's standard units as indicated and as required for a complete installation.

1. Materials: Aluminum; ASTM B 221.
2. Finish: Clear anodic.

C. Swinging Doors: Full-height piano hinge. Manufacturer's standard pulls and latch.

D. Glazing: Clear obscured fully tempered safety glazing.

E. Glazing: Safety glazing materials complying with 16 CFR 1201, Category II, with permanently etched identification acceptable to authorities having jurisdiction.

1. Glass Nominal Thickness: 6 mm.
2. Clear Glass: ASTM C 1048, Type I, Quality-Q3, Class I (clear), Kind FT.

a. Obscured Panels: Acid etched.

F. Fasteners: Manufacturer's standard stainless-steel or other noncorrosive fasteners.

G. Sealant: Mildew-resistant, single-component, nonsag, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Sealant shall have a VOC content of 250 g/L or less.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare and install per manufacturer's written instructions unless more stringent requirements are contained in GANA's "Glazing Manual."

B. Make no attachments directly into solid surface wall panels or shower receptors. Attachments through solid surface materials to be made in accordance with solid surface panel/receptor manufacaturer's written instructions.

C. Clean substrates, removing projections, filling voids, and sealing joints.

D. Set units level, plumb, and true to line, without warp or rack of frames and panels, and anchor securely in place.

E. Fasten components securely in place, with provisions for thermal movement. Install with concealed fasteners unless otherwise indicated.

F. Install components to drain and return water to tub or shower.

G. Install doors to produce smooth operation and tight fit at contact points.

H. Repair, refinish, or replace components damaged during installation.

3.2 ADJUSTING AND CLEANING

A. Adjust operating parts and hardware for smooth, quiet operation and watertight closure. Lubricate hardware and moving parts.

B. Remove nonpermanent labels, and clean surfaces immediately after installation.

END OF SECTION

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SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes solid surface material in restrooms for:

1. Countertops and backsplashes.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials and sinks.

B. Shop Drawings: For countertops and sinks. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. E. I. du Pont de Nemours and Company.
2. LG Hausys America, Inc.
3. Wilsonart LLC.

C. Type: Provide Standard type unless Special Purpose type is indicated.

D. Colors and Patterns: As selected by Architect from manufacturer's full range.

E. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch-sanded.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Custom.

B. Configuration:

1. Front: Straight, slightly eased at top.
2. Backsplash: Straight, slightly eased at corner.

C. Countertops: 3/4-inch-thick, solid surface material with front edge built up with same material.

D. Backsplashes: 1/2-inch-thick, solid surface material.

E. Joints: Fabricate countertops without joints.

F. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.

PART 3 - EXECUTION

3.1 DELIVERY AND PROTECTION

A. Provide protection of countertop and sink assembly. Transport assembly to jobsite in cutout carrier to provide support and protection during transportation and installation.

3.2 INSTALLATION

A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer.

B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions.

D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.

F. Install aprons to backing and countertops with adhesive.

G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

H. Apply sealant to gaps at walls.

END OF SECTION

SECTION 12 61 00 - FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Interior furniture.
2. Transportation, delivery, assembly, and final placement.
3. Off-site warehousing.

B. Bidding and Contract requirements:

1. Refer to bidding and contract administration requirements in documents listed in Table of Contents in the Project Manual.
2. Base costs for orders placed within or after bid holding period upon costs in effect at time of ordering; subsequent price increases will not be paid by Owner or Architect.
3. Project will be installed in one phase. See scope of work summary.

C. Quantities:

1. Bidder is responsible to verify quantity take-offs from the drawings and specifications provided. Location codes and quantities are provided to assist in locating items only. If a quantity discrepancy is found between the specifications and the drawings, the higher quantity shall prevail.

D. Finishes:

1. After award of contract, Architect will select finishes based on those submitted.
2. Finishes will be manufacturers standard, or as noted.

E. Warranties: Minimum 10-year warranty on all furniture.

1.3 SUBMITTALS

A. Reference Division 1 Section “Submittal Procedures”.

B. General: All paper-type submittals to be in the form of PDF’s.

C. Submit items indicated below to the Architect.

1. Manufacturer’s PDF’s of product literature and entire retail price list per each specified item.
   a. Include cleaning, stain removal methods and recommended cleaning materials, polishes and waxes.
   b. Include maintenance instructions and parts lists.
   c. Include warranty information and/or certificates.
2. Three actual finish samples of each finish and upholstery to be specified or selected by Architect.
3. PDF’s of shop drawings for special and custom items for review by Architect.
4. Copies of manufacturer’s order acknowledgments within twenty (20) days after contract award.
5. Substitution submittals:

a. Information assembled to support proposed "substitution" shall be submitted in duplicate for use by Owner and Architect.

b. Prepare a Schedule and Specification sheet accurately identifying each product proposed for "substitution".

6. Operation and Maintenance Data in the form of hardcopies in binders as specified in Division 1 Section "Operation and Maintenance Data."

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Where sizes of "substitutions" are not identical to those specified, it must be so noted in Bid. Size differences may be acceptable provided that Bidder can demonstrate complete dimensional compatibility with other related products and construction.

B. Where other manufacturers' products are quoted as "substitutions" perform below the standard specifications, or are not available, such deviation must be so noted in Bid. Architect may require special fabrications to equal or exceed the standard. Costs of same must be quoted prior to contract awards.

1. Where specific finish requirements are noted and where this is not a substituted manufacturers' standard, include any up-charges for this option.

2.2 MANUFACTURERS AND PRODUCTS

A. See appendix following this Section.

2.3 ADDITIONAL SERVICES

A. Warehousing beyond specified time in Part 1 herein:

1. Cost by cubic foot, square foot, weight or other means of measure.

2. Pro-rate in fourteen day increments.

B. Additional labor rates per hour for adjustments and moving items beyond that specified, as requested by Owner or Architect.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that areas or rooms are ready to accept furnishings.

B. Protect areas surrounding this work from damage.

3.2 INSTALLATION

A. Assemble items per manufacturers' instructions.

B. Place items as indicated on Drawings.

C. Level items after placement.

3.3 ADJUSTMENT AND CLEANING

A. Remove tags and labels from furniture and furnishings.

B. Clean dust, dirt, grease and adhesives from items; clip loose threads if non-injurious to fabric. Do not pull threads.

C. Remove shipping cartons, packing materials and other related installation debris from job site. Leave area in occupiable condition.

D. Repair or replace scratched, dented, nicked, warped, bent, discolored, or incorrectly colored or finished surfaces or items. Repair or replace non-functioning parts or items. Replace entire item when the sum of the parts replaced exceeds the original amount of the item as specified, as determined by the Owner or the Architect.

E. Repair or replace finish surfaces or items of building construction soiled or damaged by work specified herein. Match adjacent material, surfaces or items.

3.4 TEMPORARY FURNITURE

A. Temporary furniture equal in function to specified item shall be loaned at no cost to Owner for items:

1. Not delivered as per original acknowledgement due to no fault of Owner or Architect.
2. Found by Owner or Architect to be unusable and requiring replacement.
3. Requiring removal from site for repair.

3.5 APPENDICES

A. The following are considered part of this specification section:

1. Appendix A: “Furnishings Specifications”.

END OF SECTION

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Furnishings Specifications

TAG	MFR.	DESCRIPTION	QUANTITY	IMAGE
S1	SitOnIt	Armless Side Chair Lumin, model no. 1011-FT1 PS A0 CL12 Stacking armless side chair, molded back, vinyl flooring casters. Frame color: "Silver" Back/seat color: "Sterling" **NO SUBSTITUTIONS**	6	
S20	Southwest Contract	Sofa Madison Sofa, no. HB-6033 Three-seat sofa with wood block legs 33"h x 79"l x 36"d Premium (2.55 lb/cu. ft. density) foam Velcro seat cushion Upholstery: Maharam "Crush" no. 464780 with impermeable Crypton backing and mfr's. std. stain resistant finish. Colors to be chosen by architect from mfr's. full range Leg color: To be selected by architect from manufacturer's standards	51	
	Alternate Mfr's.	Ecologic Ideon RT London		

Furnishings Specifications

TAG	MFR.	DESCRIPTION	QUANTITY	IMAGE
S25	Southwest Contract	Lounge Chair Madison Sofa, no. HB-6031 Lounge chair with wood block legs 33"h x 38"l x 36"d Premium (2.55 lb/cu. ft. density) foam Velcro seat cushion Upholstery: Maharam "Crush" no. 464780 with impermeable Crypton backing and mfr's. std. stain resistant finish. Colors to be chosen by architect from mfr's. full range Leg color: To be selected by architect from manufacturer's standards Alternate Mfr's. Ecologic Ideon RT London	102	
T15	National Office	Rectangular Activity Table Waveworks, 36" wide x 72" long x 29" high 4-seat, fixed-top, activity table with flat, molded pvc edge and mobile column legs (vinyl flooring casters.) Leg color: "Platinum Metallic" Top laminate: 822 "Smoke Quarstone" Top edge color: Graphite Note 36" width **NO SUBSTITUTIONS**	1	

Furnishings Specifications

TAG	MFR.	DESCRIPTION	QUANTITY	IMAGE
T20	Southwest Contract	Coffee Table Cube, custom length and finishes Plastic laminate coffee table with bottom shelf, PVC edge banding and metal legs 18"d x 18'h x custom 42"l Laminate: Match architect's sample Edge band: TBD Leg color: To be selected by Architect from manufacturer's standards Alternate Mfr's. Ecologic Ideon RT London	51	 Similar: coffee table pictured
ALTERNATE A-A2 T20	Heller	In lieu of T20 basis-of-design coffee table, Southwest Contract Cube (listed above), provide: Gehry Bench, model no. 1018 Rotational-molded polymer bench/table 19.6"d x 16.75'h x custom 50"l Color: To be selected by architect from manufacturer's full range Alternate Model Heller Vignelli Bench, model no. 1031 Knoll Stones, model no. 85T32M	51	

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SECTION 142700 ELEVATOR CAB INTERIORS

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. Section includes existing elevator cab wall and ceiling finish systems and accessories.

B. Related Requirements:

1. Section 096519 "Resilient Tile Flooring" for cab floor finish.
2. Electrical Drawing Sheets and Specifications for elevator lighting.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating ceiling and wall panel layouts, accessories and associated construction.

C. Samples for Initial Selection: For finishes involving color selection.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials and components in manufacturer's protective packaging. Store materials and components, off of ground, under cover, and in a dry location.

1.5 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace work that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Manufacturer's standard warranty period, but not less than one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ELEVATOR CAR FINISH SYSTEMS MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. FabACab
2. Forms+Surfaces
3. G&R Custom Elevator Cabs
4. SnapCab
5. QCAB Custom Elevator Cabs

B. Source Limitations: Obtain all components from single manufacturer.

2.2 CAB FINISHES

A. General: Provide wall panels with removable cab ceiling.

B. Provide all trim, closures, and accessories for a complete, finished installation.

C. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Floor Finish: Resilient tile as specified in Section 096519.
2. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to with manufacturer's standard protective edge trim. Panels have a flame-spread index of 25 or less, when tested according to ASTM E 84.
   a. Plastic laminate color, texture and pattern: Match Architect's sample.
3. Fabricate panels with recesses and cutouts for signal equipment.
4. Plastic-Laminate Ceiling: Flush panels.
   a. Plastic laminate color, texture and pattern: Match Architect's sample.
   b. Provide removable panel for access to escape hatch.
   c. Align ceiling panel joints with joints between wall panels.
   d. LED downlights as indicated in Electrical Drawings and Specifications.
5. Toe kick and vertical corner trim: Minimum 20 gage stainless steel with Satin no. 4 finish.

2.3 FINISH MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

D. Stainless-Steel Bars: ASTM A 276, Type 304.

E. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

F. Aluminum Extrusions: ASTM B 221, Alloy 6063.

G. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications and Type BKV for panel backing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare surface and substrates to receive new finishes according to finish system manufacturer's written instructions..

B. Protect elevator finishes, fixtures and equipment from damage..

3.2 INSTALLATION

A. Install new finish systems according to manufacturer's written instructions.

B. Do not make structural changes to the elevator cab.

C. Do not install work in a manor that in any way interferes with the operation of the elevator.

3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces and finishes according to manufacturer's written instructions.

B. Protect exposed surfaces and finishes from damage by subsequent construction.

END OF SECTION

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SECTION 22 05 00 – GENERAL PLUMBING PROVISIONS

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 specifying the general requirements for execution of that portion of the Work defined in Division 22 of these Specifications and as indicated on the Drawings:
   1. Major items include, but are not necessarily limited to:
      a. Piping, fittings and valves.
      b. Piping and equipment insulation.
      c. Demolition of existing plumbing work.
      d. Labor, materials, equipment, tools, supervision and start-up services.
      e. Incidental and related items necessary to a complete and functionally operational installation of the Work.

B. Division of Work: In accordance with the General Conditions, Contractor is responsible for dividing the Work among the Subcontractors and Suppliers and for delineating the Work to be performed by specific trades. The following are suggestions as to how the Work may be divided. This is not a complete list of all the Work:
   1. General Contractor:
      a. Refer to Division 01 Section “Cutting and Patching.”
   2. Plumbing Subcontractor:
      a. Refer to Division 01 Section “Cutting and Patching.”
      b. Furnish location, size and quantity of openings to Contractor before construction of new walls, ceilings, and floors.
      c. Perform final cleaning of plumbing systems and equipment.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of Division 22 shall comply with the following:
   1. ANSI:
      a. A13.1 - Standard for the Identification of Piping Systems.
      b. NSF/ANSI 61-2012 – Drinking Water System Components, Health Effects.
      c. NSF/ANSI 372 – 2011 – Drinking Water System Components, Lead Content.
   2. ASME: B31.9 - Building Services Piping.
   3. ASTM: A325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   4. EPA: US Safe Drinking Water Act (US SDWA) – 2014.
   5. Ohio:
      a. Building Code of 2017.
      b. Plumbing Code of 2017.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. Construction details, components, accessories, sizes and model numbers indicated on the Drawings or in these specifications are used to indicate minimum levels of quality and coordination requirements.

B. Equipment supplied, whether as scheduled or selected from list of acceptable Manufacturers, must meet minimum requirements listed in specifications or on Drawings, be compatible with facility and intended use, and meet requirements for a functional system.

C. Drawings:
   1. Are diagrammatic and indicate general arrangement of systems and work included.
   2. Do not necessarily indicate every required valve, fitting, trap, thermometer, gage, duct, elbow, transition, turning vane, mounting support and access panel.
   3. Shall not be scaled for measurement or installation location.
   4. Shall not serve as Shop Drawings.

D. Schedules and model numbers shall not be used to:
   1. Serve as final, definitive quantity requirements. Contractor shall make own count as indicated on Drawings.
   2. Determine proper type or model with arrangement, mounting and accessories applicable.

E. Coordinate installation work of Division 22 with work of other trades to provide a complete and functional system. Generally, the location of ductwork, sanitary, storm and vent piping take precedence over fire protection and HVAC piping, electrical conduit and cable trays.

1.5 QUALITY ASSURANCE

A. Comply with all State and Local requirements.

B. All products and components that conveys or dispenses water for human consumption through drinking or cooking must comply with US SWDA – 2014, NSF 61- 2012, and NSF 372-2011.
   1. Compliance must be certified and labeled by an independent accredited testing agency.

1.6 PRODUCT UNLOADING AND HANDLING

A. Unload equipment and materials required for completion of the Work.

B. Handle and store equipment and materials carefully to prevent damage. Method of rigging and handling shall be subject to the approval of an authorized representative of the equipment Manufacturer whose equipment is being handled.

1.7 TROUBLESHOOTING

A. By Contractor: If, during the start-up or warranty period, mechanical systems operational problems occur for which the root cause is not readily apparent, Contractor shall promptly, through a Subcontractor or other resource designated by Subcontractor, provide diagnostic and investigative services to determine the cause or causes.

B. By Engineer:
   1. At Contractor's request, Engineer will provide the services necessary to determine the cause or causes of the operational problems.
   2. Under the provisions of the General Conditions, Engineer will also provide these services if Contractor fails to respond satisfactorily to operational problems within a reasonable time after written notice from Engineer.
   3. If while working at Contractor's request or under the provisions of the General Conditions, Engineer determines that the problems are due to failure of the Work to comply with the requirements of the Contract Documents, Owner will compensate Engineer for additional services and deduct the amount paid from payment or payments to Contractor.

1.8 MAINTENANCE

A. Special Tools: Where special tools are required for operation, furnish these to Owner.

B. Loose and Detachable Parts:
   1. Retain loose and small detachable parts of the apparatus and equipment furnished until the completion of the Work.
   2. Turn over these parts to Owner.

C. Construction Strainers:
   1. Remove after flushing and cleaning and prior to turn over to Owner.
   2. Attach removed construction strainer to piping where removed as proof of removal.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Character of Work: Installation shall be executed in a workmanlike manner and shall present a neat mechanical appearance when completed.

B. Laying Out of Work:
1. Layout piping, equipment and components in accordance with the Contract Documents and the Manufacturer's recommended practice, including provision of adequate space for maintenance. Review layout with Engineer prior to installation.
2. Check drawings of other trades to verify spaces in which work will be installed. Maintain maximum head room and space conditions at all points. Where head room or space conditions appear inadequate, notify Engineer before proceeding with installation.
3. If directed by Engineer, Contractor shall make reasonable modifications in the layout as required to permit proper execution of the Work and to prevent conflict with work of other trades.
4. Work shall be installed so as to be ready for operation, maintenance and repair. Minor deviations from Drawings may be made to accomplish this. Changes shall not be made without approval of Engineer.

3.2 MODIFICATIONS TO EXISTING FACILITIES

A. Comply with the requirements of Division 02 Section "Demolition" for removal of existing pipes, equipment, and other systems.

B. Comply with the requirements of Division 02 Section "Selective Demolition," for all work related to the modification, alteration, conversion, renovation and reuse of existing facilities.

3.3 PIPE FITTINGS

A. Provide insulating couplings or unions where dissimilar materials are joined.

B. Provide unions at valves and at equipment for making repairs.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:
1. Provide when required by individual Section.
2. Provide the following services except where indicated otherwise in individual Sections:
a. Inspect, check and approve system installation.
b. Supervise system start-up.
c. Provide written report indicating that system:
1) Has been properly installed and lubricated.
2) Is in accurate alignment.
3) Is free from undue stress imposed by connecting lines or anchor bolts.
4) Has been satisfactorily operated under full load conditions.
d. Demonstrate operation of system to Owner's personnel.
e. Instruct Owner's personnel on operation and maintenance of system.

B. Performance Test:
   1. Test the entire Work, including all of its individual systems for 2 weeks before final payment will be made.
   2. Every phase of plumbing plant shall be operated separately, or in conjunction one with the other to demonstrate to Engineer the ability of the plant to meet capacity and performance requirements while maintaining design condition, in accordance with the true intent and purpose of these Specifications.
   3. Make final tests in the presence of Owner and Engineer.
   4. If a part of the Work or equipment does not meet Specifications:
      a. Correct the situation.
      b. Obtain approval of Engineer before final payment is made.
   5. Provide the personnel and bear costs for correcting malfunctions.
   6. Owner will provide operating personnel and utilities.

3.5 CLEANING AND FINISHING

A. Entire installation shall be free from surface oil and grease before work will be considered for final payment.

B. After tests have been made and the system pronounced tight:
   1. Clean piping and equipment.
   2. Lubricate bearings.

C. Final cleaning includes but is not limited to the following:
   1. Plumbing Fixtures:
      a. Clean with mild soap and water containing a disinfecting agent.
      b. Set trim handles at same angle and polish.
      c. Remove, clean and reinstall aerators.
      d. Check pop-up wastes for proper operation.

END OF SECTION

SECTION 22 05 73 – TESTING AND CLEANING OF PLUMBING 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 providing testing and cleaning services and the major items listed below:
   1. Provide all pumps, gages, valves and other equipment and material necessary to properly conduct tests and perform cleaning.
   2. Arrange and pay for all costs of utilities and chemicals required for the Work.
   3. Repair and Restore All Work Damaged:
      a. By tests.
      b. By cutting required in connection with the tests.

1.3 SUBMITTALS

A. Flushing and Cleaning:
   1. Submit certificates for all code-required inspections.
   2. Submit all water Sample analysis reports as required in Part 3 of these Specifications.

B. Pressure Test Reports:
   1. Submit within 1 week after each system pressure test.
   2. List time, date and persons present for the following for each system:
      a. Initial tests.
      b. Final test.
   3. Include report indicating:
      a. Test type and duration.
      b. Initial pressure.
      c. Final pressure.
   4. Indicate that necessary repairs and final tests were satisfactorily completed.

1.4 QUALITY ASSURANCE

A. Comply with all applicable codes.

B. Secure State Health Department approval for potable water systems.

C. Testing and Cleaning Agency:
   1. Minimum 15 years' experience in providing cleaning chemicals for water systems use.
   2. Provide regional laboratory support services.

PART 2 - PRODUCTS

2.1 CLEANING AGENT MANUFACTURERS

A. Aqua-Chem.

B. Aquatrol.

C. Enerco.

D. Nalco.

2.2 MATERIALS

A. Detergents, solvents and other cleaning agents shall be compatible with materials of fabrication of systems where they are used. No cleaning agent shall adversely affect materials or mechanisms in systems and cleaning agents shall be acceptable to equipment manufacturers and the plant environmental coordinator.

B. Detergents, solvents and other cleaning agents shall be compatible with process streams to be handled by systems in which the cleaning agents are used.

C. Owner will provide water for pipe cleaning and flushing. Other cleaning fluids, agents, and equipment shall be provided by Contractor.

D. Provide the necessary temporary equipment required for cleaning and flushing operations.

E. Provide permanent hose connections for supply, discharge and recirculating lines for the new piping system.

F. Provide piping at the ends of the main and branch lines of the piping system as required to accomplish flush of the piping.

G. Provide a temporary pump of sufficient head and GPM required to achieve a flushing velocity of at least 10 feet per second.

H. Provide temporary chemical skids with tote tanks as required for mixing chemicals and serving as a source reservoir and/or collection point for cleaning and flushing solutions.

I. Provide temporary bag filters (with filter bags) as required for removal of contaminants from flushing process.

J. Provide all hose, electrical leads and supply connections for completion of system required to fill, drain and refill of the lines utilizing plant supplied water and power.

PART 3 - EXECUTION

3.1 PIPING SYSTEM PRESSURE TEST

A. General:
   1. Perform all tests before piping is painted, covered, concealed or backfilled.
   2. Before testing, remove or otherwise protect from damage, control devices, air vents, fixtures, meters, or other parts which are not designated to withstand test pressures.

B. Test Procedures:
   1. Air Test:
      a. Charge with air to the test pressure specified.
      b. When possible, perform test when ambient air temperature is constant.
   2. Soap Test:
      a. Charge with air, water or carbon dioxide to pressure specified.
      b. Examine all joints for leaks with a soap suds solution.
   3. Water Test:
      a. Charge with water to the pressure specified.
      b. Exterior Surface of Pipe and Fittings:
         1) Show no cracks or other form of leaks.
         2) Completely drip dry.

C. Pressure Test Criteria:
1. Test criteria below are minimum requirements. In addition, the requirements of State and Local Codes having jurisdiction shall be met:

Piping System	Type Test	Pressure	Allowable Pressure Drop	Minimum Test Duration
Drainage System	Water	5 psig	0 psi	30 Minutes
Water (Domestic)	Water	100 psig	0 psi	4 Hours

3.2 FLUSHING AND CLEANING PROCEDURES

A. Preinstallation Cleaning:
1. Before installation, unless otherwise specified, piping shall be cleaned as follows:
a. Hammer, brush, scrub with soapy rags, to loosen sand, dirt, or scale when necessary. Remove excess grease and oil from exterior surface.
b. Blow with air, or flush with clean water, and inspect before erection.
c. Pipe cleaned and stored before installation shall be dried and ends sealed with a rigid plug or flange protector and tape.
d. Physical cleaning procedures shall not damage materials or mar surfaces of such materials. Hammering shall not be used on cast iron, fiberglass-reinforced plastic, or plastic pipe.

B. Prior to Flushing:
1. Remove orifice plates, traps, strainer elements, flow control valves, prior to or during process of cleaning. Remove instruments which might be damaged by cleaning procedures. Replace such items with spool pieces, plugs, or blind flanges. A "blind list" shall be prepared listing where blinds have been installed for cleaning and shall be provided to Owner after cleaning is complete to verify that all blinds have been removed.
2. Items removed from piping system shall be cleaned separately.
3. Lock valves in open position.
4. Use new gaskets, thread lubricants when removed items are reinstalled after cleaning.
5. Temporary Strainers: Disconnect piping to be flushed from equipment or install temporary strainers immediately upstream of such equipment.

C. System Protection:
1. Protect piping and equipment against overpressure, collapse from vacuum, and hydraulic shock during flushing and draining procedures.
2. Exercise special care with polyvinyl chloride (PVC) and fiberglass-reinforced plastic (FRP) piping and upon initial filling of long pipe runs to determine that pipe is in contact with hangers and supports before filling. Piping bowed out of hangers or supports will settle or lengthen during filling and resulting forces may be damaging at changes in direction.
3. Install high point vents and low point drains required to remove trapped air and to drain flushing liquid.

D. Domestic, Fire Protection and Other Open Water Piping Systems: Flush with clean water until all foreign matter is removed.

E. Remove and clean all strainers after flushing is complete.

F. Drain completely and refill after flushing.

3.3 POTABLE WATER PIPING DISINFECTION

A. Disinfect new or repaired potable water systems in accordance with the method prescribed by the local health authority or, in the absence of a prescribed method, in accordance with either AWWA C651 or AWWA C652 or in accordance with the current edition of the International Plumbing Code as described below. This requirement shall apply to “on Site” or “in-plant” fabrication of a system or to a modular portion of a system.

B. Flush the piping system with clean, potable water until dirty water does not appear at any of the points of outlet. Coordinate disposal of all flushing and disinfecting water with the plant environmental coordinator. Install temporary hoses as required to reach existing disposal points, or collect the water in a portable tote tank for transfer to the proper disposal location.

C. Fill the piping with a water/chlorine solution containing at least 50 parts per million (50mg/L) of chlorine, and the piping shall be valved off and allowed to stand for 24 hours; or the piping shall be filled with a water/chlorine solution containing at least 200 parts per million (50mg/L) of chlorine, and allowed to stand for 3 hours; after which the chlorine level shall be tested.

D. Following the required standing time and testing, flush the piping with clean potable water until the chlorine is purged from all parts of the system piping.

E. A bacteria test by an independent agency shall be performed, after the chlorine test has passed. Based on the result from the bacteria test, potable water shall be opened for service. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

F. Submit water Sample to State Health Department for test and approval.

END OF SECTION

SECTION 22 07 19 – PLUMBING PIPING INSULATION

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 furnishing and installation of piping insulation.

1.3 REFERENCES:

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Specifications:
      a. B209 - Aluminum and Aluminum Alloy Sheet and Plate.
      b. C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
      c. C547 - Mineral Fiber Preformed Pipe Insulation.
      d. C552 - Cellular Glass Block and Pipe Thermal Insulation.
   2. ASTM Standard Test Methods: E84 - Surface Burning Characteristics of Building Materials.
   3. National Fire Protection Association (NFPA) publications: NFPA 255 - Surface Burning Characteristics of Building Materials: 25, 50, 50 flame spread, fuel, smoke.
   4. ASHRAE: 90A - Energy Conservation in New Building Design, current edition.

1.4 SUBMITTALS

A. Manufacturer's Literature: For piping insulation.
   1. For Each Type Used:
      a. Name of Manufacturer.
      b. Details of construction and installation.
      c. Manufacturer's data (density, K-factor).
   2. For Each Application:
      a. Thickness.
      b. Total "R" value.
      c. Jacket material.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unbroken, brand marked containers or wrapping as applicable. Handle and store materials in a manner which will prevent deterioration and contamination with foreign matter.

B. Reject damaged, deteriorated, or contaminated material and immediately remove from the Site. Replace removed materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Insulation:
1. Pittsburgh-Corning.
2. Owens-Corning.
3. Certainteed.
4. Armacell.
5. Rubatex.
6. Knauf.
7. Johns Manville.

B. Jacketing:
1. Ceel-Co.
2. O'Brien.
3. Zeston.
4. Childers.
5. Pabco.

C. Adhesives:
1. Benjamin Foster.
2. Childers.
3. Vimasco.
4. B.E.H.
5. Or equal.

2.2 TYPES OF INSULATION MATERIALS

A. Rigid Molded Glass Fiber – General (FG):
1. All-service jacket (ASJ) type factory applied jacketing.
2. 3 lbs/cu ft minimum density.
3. k factor of 0.23 at 75 degrees F mean.
4. 50 degree F service temperature.
5. Owens-Corning Type ASJ Max Pipe Insulation with SSL Max closure system; or equal.
6. Typical for application on pipes 16 inches and up.

2.3 PIPE AND FITTING COVERS

A. Polyvinyl Chloride (PVC) Covers:
1. Ultraviolet resistant.
2. 0.030-inch minimum thickness.
3. Preformed to match outer diameter of insulation.
4. Preformed fitting covers, minimum 10 mil.
5. Ceel-Tite 330; or equal, by Topline or Zeston.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install piping insulation:
a. In conformance with the Drawings. these Specifications, and the Manufacturer's recommendations.
b. After piping system has been satisfactorily tested.
c. Over clean, dry piping system.
d. To the following thickness:
1) As specified herein or as indicated on the Drawings.
2) If not specified herein or indicated on the Drawings, in accordance with Manufacturer's recommendations for the specific application.
e. Continuous through walls, ceilings and sleeves except at fire stops.
2. Fill all cracks and voids with insulating cement carefully troweled to leave a smooth finish.
3. Repair or replace insulation damaged by:
a. Demolition.
b. Making connections to piping or equipment.
c. Water or mildew.
4. Insulate bundles of pipes out-of-doors with complete wrap of insulation 1-1/2 inches thick and of suitable diameter to contain bundle, with outer wrap.
5. Pipe Sizes 12-inch and Larger: Hold each 3-foot section of insulation in place with at least 3 separate loops of No. 14 AWG stranded annealed wire.

B. Joints and Fittings:
1. Block insulate valves and flanges with reusable insulation system.
2. Insulate elbows, tube turns, sweeps and bends with mitered sections or premolded fittings. Match pipe covering material where used.
3. Fit joints tightly together.
4. Seal joints with sealing compound and preformed aluminum bands.

3.2 JACKETS AND FINISH

A. General:
1. Provide moisture barrier between the insulation and the jacketing in a continuous, unbroken seal.
2. Hold jacketing in place by a continuous sealed joint, providing a positive weatherproof seal along the entire length of the jacket.
3. Cap off ends with caps.
4. On cold lines, cut caps to the exact size of the pipe and seal with a recommended silicone calking.
5. Provide slip joints a minimum of every 25 feet or as needed for expansion.
6. Locate longitudinal jacket seams on indoor exposed piping out of view.

B. PVC:
1. Center a preformed strap (snap-strap) containing a permanently weatherproof plastic sealant over each circumferential joint and secure by tightening on a clip, or by use of a separate stainless steel banding.
2. Design snap-strap to take care of normal expansion.
3. Cover all pipe insulation and preformed insulation fittings.
4. Weld longitudinal seams together with welding adhesive as supplied by cover Manufacturer.
5. Overlap adjacent jacketing 3/4-inch and weld circumferential seams together with welding adhesive.
6. Overlap fitting covers to adjacent pipe insulation jacketing. Weld longitudinal and circumferential seams together with adhesive.

C. Attachment:
1. For systems operating at 50 degrees F and above: May be stapled using outward clinch staples spaced 3 inches apart at least 1/4-inch from the lap edge.
2. For systems operating below 50 degrees F: Vapor seal laps using self-sealing lap, lap seal tape gun or adhesive such as Benjamin Foster 85-60.

D. Taper and seal insulation ends regardless of service.

E. Fitting and pipe jackets to have matching finishes ready for painting.

F. For Insulation Without Factory Applied Jacket:
1. Finish with 8-ounce glass mesh and mastic.
2. Use breather mastic on piping operating at temperatures greater than 50 degrees F.

3.3 PIPING INSULATION APPLICATION SCHEDULE

A. Basis of Thickness Chart:
1. Thicknesses shown are based on products having a maximum "k" factor of 0.26 at a mean temperature of 75 degrees F.
2. These Thicknesses:
a. Can be reduced for products having significantly lower "k" values.
b. Shall be increased for products having higher "k" values in order to produce equivalent or greater thermal resistance.

B. Flame/Smoke Ratings: Local requirements for flame and smoke ratings must be met and may exclude some options listed herein.

C. Jackets and Finish Application:
1. Provide PVC jacket on insulated exposed piping within 7 feet of the floor.

D. Thickness Chart (In Inches):
1. Key: Insulation Type (Refer to Paragraph 2.2 of this Section):
a. FG = Rigid Fiberglass.

			PIPE SIZE					
	Piping Systems Type	Temp (F) Range	Less Than 1″	1″ to 1-1/4″	1-1/2″ to 3″	4″ to 6″	8″ & Up	Type of Insulation *
1.	Domestic Hot Water	120-200	1.0	1.0	1.0	1.5	1.5	FG, E
2.	Domestic Cold Water/Non-Potable Cold Water	40-80	0.5	0.5	1.0	1.0	1.0	FG, E

* See PART 2 – PRODUCTS Article 2.2 TYPES for types of insulation.
** Downspouts, including sump, horizontal piping and first 2 feet of vertical.

END OF SECTION

SECTION 22 10 00 – PLUMBING PIPING AND SPECIALTIES

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 furnishing and installation of all materials, labor, equipment, supervision, fees, and services incidental to proper completion of all plumbing system work:
   1. Domestic cold water system.
   2. Domestic hot water system.
   3. Interior waste and vent piping.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ANSI/ASME Standards:
      a. A112.19.2 - V.T. China Plumbing Fixtures.
      b. A112.1.2 - Air Gaps in Plumbing Systems.
      c. A112.21.1 - Floor Drains.
      d. A112.21.2 - Roof Drains.
      e. A112.36.2M - Cleanouts.
      f. A112.26.1 - Water Hammer Arresters.
   2. ASSE (American Society of Sanitary Engineering) Standards:
      a. 1001 - Pipe Applied Atmospheric Type Vacuum Breakers.
      b. 1003 - Water Pressure Reducing Valves.
      c. 1011 - Hose Connection Vacuum Breakers.
      d. 1012 - Backflow Preventers with Intermediate Atmospheric Vent.
      e. 1013 - Reduced Pressure Principal Backflow Preventer.
      f. 1016 - Individual Thermostatic Pressure Balancing, and Combination Pressure Balancing and Thermostatic Control Valves for Individual Fixture Fittings.
      g. 1017 - Temperature Actuated Mixing Valves for Hot Water Distribution Systems.
      h. 1018 - Trap Seal Primer Valves – Potable Water Supplied.
      i. 1044 - Trap Seal Primer Valves – Drainage Type.
   3. ASTM Standards:
      a. A53 - Steel Pipe, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
      b. A74 - Cast Iron Soil Pipe and Fittings.
      c. A181 - Carbon Steel Forgings for General Purpose Piping.
      d. A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
      e. A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
      f. A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
      g. A395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
      h. A518 - Corrosion-Resistant High Silicon Iron Castings.
      i. B88 - Seamless Copper Water Tube.
      j. B306 - Copper Drainage Tube (DWV).
      k. C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
      l. C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
      m. D2136 - Test Method for Coated Fabrics - Low Temperature Bend Test.
      n. D2657 - Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
      o. D2665 - Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
      p. D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
      q. D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
      r. D4101 - Propylene Plastic Injection and Extrusion Materials.
      s. F789 - Type PS-46 and PS-115 Poly(Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings.

4. AWWA Standards:
   a. C500 - Gate Valves for Water and Sewerage Systems.
   b. M20 - Water Chlorination Principles and Practices.
5. PDI (Plumbing and Drainage Institute) Standard: WH-201 - Water Hammer Arresters.
6. ARI Standard: 1010 - Drinking Fountains and Mechanically Refrigerated Drinking Water Coolers.
7. NSF/ANSI Standard 372 – Drinking Water System Components – Lead Content.

1.4 SUBMITTALS

A. Manufacturer's Literature: For all products required in Part 2 of this Section:
   1. Required Information:
      a. General:
         1) Name of Manufacturer.
         2) Model number.
         3) Dimensions.
         4) Details of construction and installation.
      b. Performance Data:
         1) Heat transfer devices.
         2) Pumps.
   2. Not required for piping or hangers and supports.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

B. Regulatory Agencies Requirements:
   1. All state and local codes and ordinances shall have jurisdiction.
   2. All related electrical devices shall be housed in suitable enclosures as defined by the National Electrical Manufacturers' Association (NEMA).
   3. All gas-fired appliances and installation shall be in accordance with American Gas Association (AGA) guidelines.
   4. All components used in systems in contact with drinking water shall comply with the requirements of NSF 372 for lead free.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Water distribution pipe and fittings shall conform to NSF 61 and conform to one of the standards listed in the current Plumbing Code.

B. Type L hard drawn copper with cast bronze or wrought copper, solder type fittings.

C. Soil and waste lines and fittings shall be cast iron soil pipe. 2" and smaller may be type DWV copper drainage tube with cast brass solder joint drainage fittings.

D. Vent lines shall be standard weight galvanized steel pipe and cast iron drainage fittings or cast iron soil pipe and fittings or type DWV copper drainage tube with cast brass drainage fittings, at the Contractor's option.

E. All underground lines shall be cast iron. “No Hub” joints are not permitted under slabs.

F. House drain and branches shall be cast iron soil pipe and fittings.

G. All cast iron soil pipe shall be service weight or "No- Hub".

H. Refer to schedules in Part 3 of this Specification for specific applications of pipe materials to plumbing systems.

2.2 SPECIALTIES

A. Shock Absorbers:
1. Furnish and install where indicated or wherever quick closing valves (including flush valves) are utilized. Shock absorbers shall be located and sized in accordance with Standard PDI-WH-201.
2. Manufacturer: Josam, Wade, or Zurn.

B. Dielectric Water Fittings:
1. Dielectric Couplings: Electroplated steel or brass nipple, with an inert and non-corrosive, thermoplastic lining.
2. Dielectric Unions: Provide dielectric unions with appropriate end connections for the pipe materials in which installed (screwed, soldered or flanged), which effectively isolates dissimilar metals, prevents galvanic actions and stops corrosion.

2.3 VALVES

A. Mixing Valves:
1. ASSE 1070 Point of Use Thermostatic Control Valve:
a. Certified for compliance with ASSE 1070 for individual fixture temperature control.
b. Shall use a wax filled thermostatic element to sense incoming temperature fluctuations and maintain leaving water temperature 3 degrees F of setpoint for flows down to 0.5 gpm.
c. Construction:
1) Cast bronze body.
2) Stainless steel internal components.
3) 125 psig rated working pressure.
d. Provide tamper resistant setpoint adjustment.
e. Provide with integral check valves.
f. Watts USG-B, Wilkin.

PART 3 - EXECUTION

3.1 DOMESTIC COLD AND HOT WATER SYSTEMS

A. Description: Provide as indicated on the Drawings and as required to comply with all applicable codes and regulations, complete system of piping, fittings, valves, auxiliaries and accessories as required to connect cold and hot water to all items requiring cold or hot water.

B. Pipe and Fittings: Per Part 3. D Schedules.

C. Installation:
1. All interior piping shall be run square and straight with the building.
2. Piping in finished areas shall be concealed within walls, chases, enclosures, etc.
3. Piping in exposed areas shall be run as high as possible within joists and beam spaces, or below the floor as indicated on the Drawings.
4. Piping shall follow approved paths as shown or indicated on the Drawings. Connect to existing lines where required or to equipment in an approved manner. Locate pipes, valves and equipment accessible for maintenance, minimum obstruction of passage and work spaces.
5. Install drain valves at all low points in piping system.
6. Install all required trap primer systems and piping.
7. Provide unions at each screwed valve, unions, and at all points in the piping system where necessary to facilitate dismantling.

3.2 BUILDING SANITARY DRAINAGE SYSTEM

A. Description: Furnish and install the entire building sanitary drainage system as indicated on the Drawings. System includes, but is not necessarily limited to, the following items: Waste and vent piping for all plumbing, fixtures requiring same, floor drains, cleanouts.

B. Material: Per Part 3.4 Schedules.

C. Installation:
1. General runs of sanitary sewer are indicated on Drawings diagrammatically and every bend, offset, etc., is not necessarily indicated, all of which must be installed to properly drain all stacks, fixtures, vents, etc.
2. Run horizontal waste lines at a minimum slope of 1/8-inch per foot.
3. Connections between mains and laterals shall be made with wyes and 1/8 bends.
4. Changes in direction shall be with long radius ells except in stacks where sanitary tees and short radius 1/4 bends may be used in changes from horizontal to vertical.
5. Pitch vent lines to gravity drain to waste pipe.

3.3 CLEANING, TESTING, CHLORINATION

A. As piping material is erected, the inside of all piping shall be thoroughly cleaned of foreign material. Flush and test piping before operation in accordance with Division 22 Section “Testing and Cleaning of Plumbing Systems.”

B. On completion of the domestic water piping systems, chlorinate the system using methods acceptable to and approved by Engineer. Furnish all chlorine and chlorinating equipment.

C. After system chlorination is complete, submit water Samples to the governing health department for testing. Take Samples as directed by Engineer, and provide Engineer with a letter from the governing health department indicating test results.

3.4 SCHEDULES

Storm and Sanitary				
System	Schedule	Material	Specifications	Remarks
Underground				
Sanitary: Minimum size 2 inches				
	S.V.	C.I.	ASTM A74	Bell & Spigot with Elastomeric Gasket or Lead & Oakum
Above Ground				
Sanitary	S.V.	C.I.	ASTM A74	Bell & Spigot with Elastomeric Compressive Gasket. Lead & Oakum
	S.V.	C.I.	ASTM C564, A888	No Hub
	DWV	Copper	ASTM B306	ANSI B16.23 Soldered

Domestic Water Above Ground 125 PSI Maximum Pressure					
Pipe Size	Schedule	Material	Spec	Grade	Remarks
1/4 – 6	Type L	Copper	ASTM B88	--	Solder 95/5, Silvabrite

END OF SECTION

SECTION 22 40 00 – PLUMBING FIXTURES

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 furnishing and installation of plumbing fixtures.

B. Division of Work:
1. In accordance with the General Conditions, Contractor is responsible for dividing the Work among the Subcontractors and Suppliers and for delineating the work to be performed by specific trades.
2. The following are suggestions as to how the Work may be divided. This is not a complete list of all the work:
a. General Contractor: Install or arrange for installation of all fixture supports and carriers as directed by mechanical Subcontractor.
b. Mechanical Subcontractor:
1) Furnish all required fixture supports and carriers.
2) Instruct General Contractor regarding location and installation of supports and carriers.
3) Be responsible for proper rough-in locations and dimensions.
c. Faucet Manufacturer: Provides remote transformers for barrier free special trim.
d. Electrical Subcontractor: Installs transformers for barrier free special trim.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
1. ANSI Standard:
a. A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
b. A112.19.2 - Vitreous China Plumbing Fixtures.
c. A112.19.3 - Stainless Steel Plumbing Fixtures.
d. A112.19.5 - Trim for Water Closet Bowls, Tanks & Urinals.
e. A117.1 - Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
f. Z358.1 - Standard for Emergency Eyewash and Shower Equipment.
2. ARI - Air Conditioning and Refrigeration Institute - Standard: Drinking Fountains and Self-Contained, Mechanical Refrigerated Drinking Water Coolers.
3. ADA - Americans with Disabilities Act.
4. ASSE - American Society of Sanitary Engineers.

1.4 SUBMITTALS

A. Manufacturer's Literature: For fixtures.
1. Model number/name.
2. Manufacturer's name.
3. Dimensions.
4. Color/finish.

1.5 QUALITY ASSURANCE

A. Installing personnel shall be adequately trained and experienced in the installation of the materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Fixtures: American Standard, Kohler, Elkay, Crane, Eljer, Haws, Just, Fiat, Ceco, Guardian.

B. Flush Valves: Sloan, Zurn, American Standard.

C. ADA Drain and Water Line Safety Covers at Lavatories and Sinks:
1. Handy shield safety covers, Plumberex Specialty Products, Cathedral City, CA.
2. Handi Lav-Guard, Truebro, Inc., Ellington, CT.

D. Faucets:
1. Sinks: Bradley, Moen, Zurn, Chicago Faucets, Delta, American Standard.
2. Lavatories: Wolverine Brass, no exceptions.

E. Fixture Carriers: Wade, Josam, Zurn, Watts.

2.2 GENERAL

A. Traps:
1. Equip fixtures with traps (with cleanouts) unless indicated otherwise, of the same size as the fixture connection.
2. P-traps (above grade): Cast brass, adjustable, with a cleanout plug and 17 gage tubing outlet, chrome plated.
3. Size branch lines as indicated.

B. Assemblies:
1. Where fixtures are described by a Manufacturer's assembly number, furnish the complete assembly.
2. Additional items not ordinarily furnished in the assembly will be indicated or noted.

C. Where roughing-in or installing fixtures and equipment furnished by other trades, provide required stops, supplies and traps, as well as rough-in, installation, and connecting work.

D. Finishes:
1. Vitreous China Fixtures: White, unless specifically noted otherwise.
2. Stainless Steel Fixtures: 20 gage minimum, Type 302, nickel bearing stainless steel, unless otherwise noted.
3. Trim, fittings, traps, etc., where exposed to view: Heavy chrome plated.

2.3 WATER CLOSETS, URINALS AND LAVATORIES

A. Refer to the schedules on the Drawings for specific applications and the basis of design selections.

B. Fixture Carriers:
1. Manufacturer: Wade, Zurn Josam, or Smith, Watts.
2. Requirements:
a. Secure wall mounted lavatories into position by means of carriers specifically manufactured for the fixture installed.
b. Carriers shall be of proper size to fit within the space allotted.
3. Supports: Provide adequate internal supports for wall mounting brackets.

C. Barrier Free Special Trim:
1. Incoming water shall be tempered with thermostatic mixing valve.
2. Tempered water shall not exceed 105 degrees F.
3. Barrier free lavatories shall have water supply tempered with an A.S.S.E. 1016 device.
4. ADA approved drain and water safety covers are required on all exposed piping under barrier free lavatories.

2.4 SINKS

A. Refer to schedules on the Drawings for specific applications and the basis of design selection.

B. If sink is ADA compliant or used for handwashing, incoming water shall be tempered with approved thermostatic mixing valve.

2.5 MISCELLANEOUS PLUMBING APPLIANCES

A. Refer to the schedules on the Drawings for specific applications and the basis of design selection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fixtures at proper heights in accordance with applicable codes and as indicated on the Drawings.

B. Point up around fixtures where they abut a wall or floor unless so directed by Engineer.

C. Securely fasten fixtures to the floor, wall, or counter. Fixtures shall be level and square.

D. Follow Manufacturer's instructions for fixture installations, especially for grouting and calking.

3.2 INSPECTION

A. Inspect each fixture and unit for damage to finish.

B. Remove and replace cracked, dented units and units or items unable to be repaired or restored to a condition acceptable to Engineer.

3.3 CLEANING

A. Thoroughly clean by washing with soap and disinfectant solution on all plumbing fixtures.

B. Remove, clean, and reinstall aerators.

END OF SECTION

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SECTION 23 05 00 – GENERAL HVAC PROVISIONS

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 specifying the general requirements for execution of that portion of the Work defined in Division 23 of these Specifications and as indicated on the Drawings:
   1. Major items include, but are not necessarily limited to:
      a. Piping, fittings, and valves.
      b. Piping, insulation.
      c. HVAC equipment.
      d. Demolition of existing mechanical work.
      e. Labor, materials, equipment, tools, supervision and start-up services.
      f. Mechanical systems, testing, adjusting and balancing.
      g. Incidental and related items necessary to a complete and functionally operational installation of the Work.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of Division 23 shall comply with the following:
   1. ANSI: A13.1 - Standard for the Identification of Piping Systems.
   2. ASME - American Society of Mechanical Engineers:
      a. B31.1 - Power Piping.
      b. B31.9 - Building Services Piping.
      c. Boiler and Pressure Vessel Code:
         1) Section I.
         2) Section II.
         3) Section IV.
         4) Section VIII.
   3. ASTM: A325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   4. State of Ohio:
      a. Building Code of 2017.
      b. Mechanical Code 2017.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. Construction details, components, accessories, sizes and model numbers indicated on the Drawings or in these specifications are used to indicate minimum levels of quality and coordination requirements.

B. Design and layout, including clearances and service access, are based on Manufacturer, model and components as scheduled or otherwise indicated on the Drawings. Other listed approved Manufacturer's components and equipment are acceptable provided the following conditions are satisfied:
   1. Meet minimum requirements listed in specifications or on Drawings, be compatible with facility and intended use, and meet requirements for a functional system.
   2. Present to Engineer documentation verifying that all the above conditions are satisfied at least 10 days prior to bid receipt date.

3. Meet all sound criteria as listed. Additional sound attenuation materials may be used if required.
4. Coordinate and pay for all changes resulting from the use of alternate equipment and components:
   a. Coordinate and pay for all resulting work in other trades, including redesign efforts.
   b. Make all duct and piping system changes required in utilizing alternate equipment. Changes must reflect building conditions, ceiling spaces, chase sizes, structure locations.
   c. Obtain Engineer's prior approval for all changes to layout, clearances, components and service access proposed.

C. Drawings:
1. Are diagrammatic and indicate general arrangement of systems and work included.
2. Do not necessarily indicate every required valve, fitting, trap, thermometer, gage, duct, elbow, transition, offset turning vane, mounting support and access panel.
3. Shall not be scaled for measurement or installation location.
4. Shall not serve as Shop Drawings.

D. Schedules and model numbers shall not be used to:
1. Serve as final, definitive quantity requirements. Contractor shall make own count as indicated on Drawings.
2. Determine proper type or model with arrangement, mounting and accessories applicable.

E. Coordinate installation work of Division 23 with work of other trades to provide a complete and functional system. Generally, the location of ductwork, sanitary, storm and vent piping take precedence over fire protection and HVAC piping, electrical conduit and cable trays.

1.5 PRODUCT UNLOADING AND HANDLING

A. Unload equipment and materials required for completion of the Work.

B. Handle and store equipment and materials carefully to prevent damage. Method of rigging and handling shall be subject to the approval of an authorized representative of the equipment Manufacturer whose equipment is being handled.

1.6 TROUBLESHOOTING

A. By Contractor: If, during the start-up or warranty period, mechanical systems operational problems occur for which the root cause is not readily apparent, Contractor shall promptly, through a Subcontractor or other resource designated by Subcontractor, provide diagnostic and investigative services to determine the cause or causes.

B. By Engineer:
1. At Contractor's request, Engineer will provide the services necessary to determine the cause or causes of the operational problems.
2. Under the provisions of the General Conditions, Engineer will also provide these services if Contractor fails to respond satisfactorily to operational problems within a reasonable time after written notice from Engineer.
3. If while working at Contractor's request or under the provisions of the General Conditions, Engineer determines that the problems are due to failure of the Work to comply with the requirements of the Contract Documents, Owner will compensate Engineer for additional services and deduct the amount paid from payment or payments to Contractor.

1.7 MAINTENANCE

A. Special Tools: Where special tools are required for operation, furnish these to Owner.

B. Loose and Detachable Parts:
1. Retain loose and small detachable parts of the apparatus and equipment furnished until the completion of the Work.
2. Turn over these parts to Owner.

PART 2 - PRODUCTS

2.1 FABRICATIONS

A. Miscellaneous Structural Steel:
1. Structural steel work shall be done in accordance with the AISC Specification for Design, Fabrication and Erection of Structural Steel for Buildings, except that allowable stresses shall be reduced 25%.
2. Where required, high strength structural steel bolting conforming to ASTM Specification A325 and assembled to AISC "Specifications for Assembly of Structural Joints. Using High Strength Steel Bolts" or welding shall be used in place of rivets.
3. Connections shall be properly designed for the type of connection and the loads to be carried, and shall be subject to Engineer's or Owner's approval.
4. Welding shall be done by operators who have been previously qualified by tests as prescribed in the American Welding Society "Standard Qualification Procedure" to perform the type of work required.
5. Welding techniques shall conform to the American Welding Society "Code for Arc and Gas Welding in Building Construction", Section 4, Workmanship.
6. Finished members shall be true to line and free from twist, bends and open joints.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Character of Work: Installation shall be executed in a workmanlike manner and shall present a neat mechanical appearance when completed.

B. Laying Out of Work:
1. Layout piping, equipment, and components in accordance with the Contract Documents and the Manufacturer’s recommended practice, including provision of adequate space for maintenance. Review layout with Engineer prior to installation.
2. Check drawings of other trades to verify spaces in which work will be installed. Maintain maximum head room and space conditions at all points. Where head room or space conditions appear inadequate, notify Engineer before proceeding with installation.
3. If directed by Engineer, Contractor shall make reasonable modifications in the layout as required to permit proper execution of the Work and to prevent conflict with work of other trades.
4. Work shall be installed so as to be ready for operation, maintenance and repair. Minor deviations from Drawings may be made to accomplish this. Changes shall not be made without approval of Engineer.

3.2 PIPE FITTINGS

A. Provide insulating couplings or unions where dissimilar materials are joined.

B. Provide unions at valves and at equipment for making repairs.

3.3 START-UP

A. Coordinate the start-up, testing and shutdown of the new equipment and systems involved.

B. Operating personnel, fuel, water, power and other utilities necessary for equipment start-up, will be furnished by Owner. Instructions shall be provided to the operators by the equipment vendor's personnel.

C. Inspection:
1. Verify that Project conditions comply with requirements.
2. Verify that status of Work meets requirements for starting of systems.

D. Preparation:
   1. Coordinate sequence for start-up of various systems.
   2. Have at hand during entire start-up process:
      a. Contract Documents.
      b. Shop Drawings.
      c. Product data.
      d. Operation and maintenance data.
   3. Verify that each piece of equipment has been checked for:
      a. Proper lubrication.
      b. Drive rotation.
      c. Belt tension, record belt deflections and forces obtained.
      d. Control sequence.
      e. Other conditions which may cause damage.
   4. Verify control systems are fully operational in automatic mode.
   5. Verify that tests, meter readings and specific electrical characteristics agree with those specified by electrical equipment Manufacturer.
   6. Motors:
      a. Check each motor for amperage comparison to nameplate value.
      b. Correct conditions which produce excessive current flow and which exist due to equipment malfunction.
      c. 3-phase Motors: Measure voltage imbalance between legs. Notify Engineer if imbalance exceeds 2%.
   7. Control Valves:
      a. Inspect both hand and automatic control valves; clean bonnets and stems.
      b. Tighten packing glands to ensure no leakage, but permit valve stems to operate without galling.
      c. Replace packing in valves to retain maximum adjustment after system is judged complete.
      d. Replace packing on any valve which continues to leak.
      e. Remove and repair bonnets which leak.
      f. Coat packing gland threads and valve stems with a surface preparation of "Moly-Cote" or "Fel- Pro" after cleaning.
      g. Verify that control valve seats are free from foreign material and are properly positioned for intended service.
   8. Flanges:
      a. Tighten flanges after system has been placed in operation.
      b. Replace flange gaskets which show any sign of leakage after tightening.
   9. Screwed Joints:
      a. Inspect screwed joints for leakage.
      b. Promptly remake each joint which appears to be faulty; do not wait for rust to form.
      c. Clean threads on both parts, apply compound and remake joints.
   10. Cleaning:
      a. After system has been placed in operation, clean strainers, dirt pockets, orifices, valve seats and headers in fluid systems, to ensure being free of foreign materials.
      b. Open steam traps and air vents; remove operating elements. Clean thoroughly, replace internal parts, and put back into operation.
      c. Remove rust, scale and foreign materials from equipment and renew defaced surfaces.

3.4 ADJUSTING

A. Adjust and align equipment for smooth operation:
   1. Plumb true and with parts in proper position and alignment.
   2. Rotating parts shall turn freely and in the correct direction.
   3. Flexible couplings shall be checked for alignment subject to Owner's approval.
   4. Follow Manufacturer's instructions.

B. The work of installation shall be executed in conformity with the best practice, so as to contribute to efficiency of operation, minimum noise or vibration, minimum maintenance, accessibility and sightliness.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:
   1. Provide when required by individual Section.
   2. Provide the following services except where indicated otherwise in individual Sections:
      a. Inspect, check and approve system installation.
      b. Supervise system start-up.
      c. Provide written report indicating that system:
         1) Has been properly installed and lubricated.
         2) Is in accurate alignment.
         3) Is free from undue stress imposed by connecting lines or anchor bolts.
         4) Has been satisfactorily operated under full load conditions.
      d. Demonstrate operation of system to Owner's personnel.
      e. Instruct Owner's personnel on operation and maintenance of system.

B. Performance Test:
   1. Test the entire Work, including all of its individual systems for 2 weeks before final payment will be made.
   2. Every phase of plumbing, air conditioning and heating and ventilating plant shall be operated separately, or in conjunction one with the other to demonstrate to Engineer the ability of the plant to meet capacity and performance requirements while maintaining design condition, in accordance with the true intent and purpose of these Specifications.
   3. Make final tests in the presence of Owner and Engineer.
   4. If a part of the Work or equipment does not meet Specifications:
      a. Correct the situation.
      b. Obtain approval of Engineer before final payment is made.
   5. Provide the personnel and bear costs for correcting malfunctions.
   6. Owner will provide operating personnel and utilities.

3.6 CLEANING AND FINISHING

A. Entire installation shall be free from surface oil and grease before work will be considered for final payment.

B. After tests have been made and the system pronounced tight:
   1. Clean piping and equipment.
   2. Lubricate bearings.

C. Final cleaning includes but is not limited to the following:
   1. Equipment with Factory Finishes:
      a. Wash factory-finished equipment with mild soap and water and leave in first-class condition, entirely free of stains or streaks.
      b. Do not use abrasive materials.
      c. Touch up scratches or other violations of the factory finish paint with matching paint from the equipment Manufacturer.

END OF SECTION

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SECTION 23 05 23 – GENERAL DUTY VALVES FOR HVAC

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 furnishing and installation of all valves.

1.3 REFERENCES

A. Except as specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.
   2. Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).
   3. Threaded: Valve ends complying with ANSI B2.1.
   4. Solder-Joint: Valve ends complying with ANSI B16.18.
   5. Flangeless: Valve bodies manufactured to fit between flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).
   6. Welded Ends: Valve ends complying with ASME/ANSI B16.5.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. General:
   1. This Section is provided as a guide in the application and specification of specific valves intended for use in this Project. This Section does not instruct where to install these valves unless specifically noted. Refer to other specific Mechanical Specification Sections and Drawing details for instruction for location and use.
   2. As indicated on the Drawings.
   3. As called out in the Piping Systems Schedules.

B. Valves not specifically indicated on the Drawings:
   1. Size and class of valve and pipe schedule to agree with line in which installed.
   2. All valves 2-1/2-inch and larger shall be flanged unless noted otherwise.
   3. All valves 8-inch and larger shall be furnished with suitable bypass valve and piping.

C. Valves shall have Manufacturer's name, trademark and working pressure rating cast into the valve body.

1.5 SUBMITTALS

A. Shop Drawings for all valves.

B. Manufacturer's Literature: For All Valves:
   1. Manufacturer's name.
   2. Details of construction.
   3. Performance characteristics.
   4. Pressure and temperature ratings.
   5. Close-off pressure.

1.6 QUALITY ASSURANCE

A. Made in USA:
   1. Unless specifically noted otherwise, all valves shall comply with the Federal Trade Commission Made in USA standard.
   2. Supplier shall furnish documentation of USA content if requested by Engineer.

B. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the material and equipment.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Valves shall be manufactured by one Manufacturer for each type of valve. Where valve Manufacturers are not specifically indicated, they shall be one of the following:
   1. Gate, Ball, Globe, Standard Butterfly, and Check Valves:
      a. Nibco.
      b. Kennedy.
      c. Crane.
      d. Milwaukee.
      e. Keystone.
      f. Stockham.
      g. Bonney Forge.
      h. Mueller Steam Specialties.
      i. Neles-Jamesbury.
      j. DeZurik.
      k. Apollo.
      l. Vogt.
      m. Walworth.
      n. Powell.
   2. Control Valves – Globe Valves (Hydronic Service):
      a. Honeywell.
      b. Johnson.
      c. Seimens.
   3. Control Valves – Characterized Ball Valves (Hydronic Service Only):
      a. Honeywell.
      b. Johnson.
      c. Seimens.
      d. Apollo.
      e. Belimo.

2.2 GENERAL

A. Materials - Bronze Valves:
   1. All brass alloys used in valves shall contain no more than 15% zinc.
   2. Alloys must comply with ASTM B61, B62 or B584.

B. Additional Materials: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by the Manufacturer for installation requirements.
   1. Provide extended stem handles and necks with a minimum clearance of 1-1/2-inch on insulated service.
   2. All valves used for throttling/balancing shall have adjustable memory stops.
   3. Pressure ratings are at service indicated by application as specified according to the individual valve specifications.
   4. Sizes: Same size as upstream pipe, unless otherwise indicated.
   5. Neck extensions and right angle drives where indicated and where required for access to the operator.

C. Operators: Provide the following special operator features:
   1. Handwheels, fastened to valve stem, for valves other than quarter turn.
   2. Lever handles, on quarter-turn valves 3-inch and smaller, except for plug valves. Provide plug valves with square heads. For valves greater than 3-inch, provide gear operator with handwheel.
   3. Provide bevel gear operators with chain-wheels for all valves installed 6 feet or higher above finished floor. Extend chains to an elevation of 5 feet above finished floor.
   4. Provide rotary manual actuators with high ratio (80 to 1 minimum), disc positions and open and closed position stops on all butterfly valves. Actuators shall be designed for valve installation with the stem in a horizontal orientation to prevent debris from accumulating in the bearings.
   5. Automatic Operators: Provide in accordance with this Section.

D. Valve Identification Systems Description:
   1. A system has been established which identifies the specific valves for each piping system as indicated on the Drawings. The specific valve specification is linked by the service number as depicted in the "Valve Index" listed in this Section.
   2. Valves may be identified on the Drawings by symbol. Size is indicated by the upstream size.
   3. Valves are specified in this Section according to the "Valve Index". In general, the following is a description of the format:
      a. The first symbol, consisting of one or more numerals, indicates the valve group pressure and temperature specification that applies to this valve.
      b. The second symbol, consisting of one or more letters, indicates the type of valve in accordance with the following listing:
         1) GB = Globe Valve.
         2) TBF = Triple Offset Butterfly Valve.
         3) HBF = High Performance Butterfly Valve.
         4) BF = Standard Butterfly Valve.
         5) BL = Ball Valve.
         6) CK = Check Valve.
         7) SCK = Silent Check Valve.
         8) GT = Gate Valve.
      c. The third symbol consists a numeral which indicates the size group.
      d. The fourth symbol, consisting of a letter, indicates the type of connection to the valve as follows:
         1) F = Flanged Ends.
         2) S = Screwed Ends.
         3) W = Weld Ends, Butt, or Socket.
      e. For example: For a 10-inch CHW shutoff valve, refer to 1BF2F which indicates a valve of Valve Group 1, Butterfly Type, and with flanged ends.
   4. There may be some instances where it is desirable to substitute an item, such as a valve or gasket at a particular location, in place of the one specified in the groups listed in the Index. In that event, the item will be clearly indicated and specified on the Drawings, and such an indication is to take precedence over the item specified in the valve group specifications. All other terms of that group specification are to be observed.

2.3 VALVE GROUP 1

A. Ball Valves:
   1. Symbol: 1BL1S - 2 Inches and Smaller:
      a. Ball valves used in connection with piping 2 inches in size and smaller shall have screwed or sweat ends, 2 piece bronze body, standard port with stainless steel ball and a like stem. VA rated for 150 pound SWP and 600 WOG. Seats and seals shall be reinforced virgin teflon for standard duty cycle.

2.4 AUTOMATIC CONTROL VALVES

A. General:
1. Comply with valve construction and trim as described in these specifications above for operating and rated pressure and temperature service group, with trim suitable for control duty as noted below. Refer to Part 3 of these specifications.
2. Sizing: 3 psi maximum pressure drop at design flow.

B. Hydronic Control Valves:
1. Where globe valves are indicated, provide straight through globe type, single seat for modulating device with equal percentage relationship between valve lift and fluid flow unless noted otherwise.
   a. Trim:
      1) Stem: Stainless steel.
      2) Plug: Stainless steel.
      3) Seat: Stainless steel, metal-to-metal.
      4) Cage: Stainless steel, replaceable.
2. Where characterized ball valves are indicated or allowed, provide characterized port ball valve for modulating device with equal percentage relationship between valve lift and fluid flow unless noted otherwise.
3. Provide globe, ball, or butterfly valve for two-position service.

C. Control Valve Actuators:
1. Size to operate with sufficient reserve power to provide smooth modulating action or 2-position action.
2. Close-off (differential) pressure rating.
3. Hydronic Systems: Combination of actuator and trim shall provide minimum close-off pressure rating of 150% of total system (pump) head for 2-way valves and 100% of pressure differential across valve or 100% of total system (pump) head.
4. Provide with neck extension on insulated service
5. Electric Actuators and Motors:
   a. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:
      1) Johnson.
      2) Honeywell.
      3) Belimo Aircontrols (USA), Inc.
      4) Siemens.
   b. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
   c. Serviceable and rebuildable.
   d. Coupling: V-bolt and V-shaped, toothed cradle.
   e. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
   f. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.

2.5 DRAIN VALVES:

A. Furnish at each low point 3/4-inch gate or ball valves as specified above.

B. Install nipple with cap at valve outlet.

PART 3 - EXECUTION

3.1 VALVE SCHEDULE

A. Unless otherwise noted on drawings or in specific application sections of this specification, the valve groups described in Part 2 of this specification shall be applied for each service type as follows:
1. Valve Group 1: Hydronic (chilled and heating water) supply and return not exceeding 125 psig or 250 degrees F.

3.2 INSTALLATION

A. Install valves in conformance with:
   1. The Shop Drawings reviewed by Engineer.
   2. The Manufacturer's recommendations.

B. Install Valves:
   1. At all branch piping connection to mains.
   2. At all connections to equipment.
   3. As required for complete control or isolation of any piece of equipment or service to branch lines.
   4. In accessible locations.
   5. Equal in flow area to connecting piping, unless otherwise indicated.

C. No valve shall be installed with its stem below the horizontal.

END OF SECTION

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SECTION 23 05 29 – HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

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 furnishing and installation of all pipe hanging and support systems.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASME - American Society of Mechanical Engineers:
      a. B31.1 - Power Piping.
      b. B31.9 - Building Services Piping.
      c. B31.8 - Gas Transmission and Distribution Piping Systems.
   2. MSS - Manufacturers Standardization Society:
      a. SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture.
      b. SP-69 - Pipe Hangers and Supports - Selection and Application - 1996.
      c. SP-90 - Guidelines on Terminology for Pipe Hangers and Supports.

1.4 DEFINITIONS

A. Pipe Restraint: Pipe supporting element which is designed to limit or direct pipe movement due to internal static pressure, gravitational forces, frictional forces from hangers, rollers, and guides, and forces from expansion compensation devices:
   1. Pipe restraints are not designed to restrain pipe movement caused by thermal expansion, shock or surge.

B. Pipe Guide: A pipe restraint designed to direct pipe movement along a single axis.

C. Pipe Anchor: A pipe restraint designed to provide a static point about which pipe movement normally occurs, by limiting the longitudinal and axial movement at that point.

D. Other Terms: As defined in MSS SP-90.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

A. Unless otherwise indicated on Drawings or in these Specifications, this Contractor shall be responsible to design and provide all pipe hangers, supports, restraints, braces, framing, etc., as required to comply with all applicable building codes, ASME B31 and MSS SP-69.

B. Comply with the requirements of ASME B31.8 for pipe hangers and support of natural gas piping systems.

1.6 PERFORMANCE REQUIREMENTS

A. Design Responsibilities:
1. Minimum Requirements:
a. Details, if any, indicated on the Drawings and Specifications contained herein are minimum requirements.
1) Engineer has designed the structure to withstand the gravity and wind induced loadings of equipment.
2) Notify Engineer of member size change requirements prior to fabrication.
b. Generally comply with layouts and configurations as indicated on the Drawings.
2. Structural Performance:
a. Design shall be performed by a professional engineer.
b. Design shall comply with the building code plus amendments and local ordinances, if any, legally adopted for the location in which the Project is located.
c. Design anchorage systems capable of withstanding design loads within limits and under conditions indicated.
1) The term "withstand" means that the unit will remain in place without separation of any parts from the device when subjected to the wind forces specified.
d. Design shall include systems that transfer gravity and wind induced loadings (including lateral, overturning and uplift effects) to the structure, including, but not limited to:
1) Anchorage between piping, ductwork or equipment and supports.
2) Anchorage between supports and building structure.
3) Spacers, blocking, straps and the like.
3. Design Loads: Dead Loads: Actual weights of materials and fixed equipment, as calculated by designer.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The materials of all pipe hanging and supporting elements shall be in accordance with the latest requirements of the ASME Code for Pressure Piping B31.1 and MSS Standard Practice MSS SP-58 and MSS SP-69 except as supplemented or modified by the requirements of these Specifications.

B. The material in contact with the pipe shall be compatible with the piping material so that neither shall have a deteriorating action on the other.

2.2 MANUFACTURERS

A. Elcon.

B. Michigan Hanger.

C. Anvil.

D. Bergen.

E. Hilti.

F. Lindapter.

G. Thybar

H. Pate

I. Mirro

J. Roof Products and Systems

K. A.E.S.

L. MicroMetl.

2.3 PIPE HANGERS AND SUPPORTS

A. Horizontal Piping Hangers: Unless otherwise indicated and except as specified in piping system Specification sections, install the following types:
1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN15 to DN750).
2. Yoke Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 degrees F (49 to 232 degrees C) pipes, NPS 4 to NPS 16 (DN100 to DN400), requiring up to 4 inches (100 mm) of insulation.
3. Carbon or Alloy Steel, Double Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN20 to DN600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN15 to DN600), if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN15 to DN100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable Swivel Split or Solid Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN20 to DN200).
7. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN15 to DN200).
9. Adjustable Swivel Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN15 to DN50).
10. Split Pipe Ring With or Without Turnbuckle Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN10 to DN200).
11. Extension Hinged or 2 Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN10 to DN80).
12. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30 (DN15 to DN750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

B. Supports and Rollers:
1. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN100 to DN900), with steel pipe base stanchion support and cast iron floor flange.
2. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN100 to DN900), with steel pipe base stanchion support and cast iron floor flange with U-bolt to retain pipe.
3. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion type support for pipes, NPS 2-1/2 to NPS 36 (DN65 to DN900), if vertical adjustment is required, with steel pipe base stanchion support and cast iron floor flange.

C. Hanger Rod Attachments: Unless otherwise indicated and except as specified in piping system specification sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 degree F (49 to 232 degree C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type II, split pipe rings.
4. Malleable Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 degree F (49 to 232 degree C) piping installations.

2.4 HANGER RODS

A. Minimum rod diameters for rigid rod hangers shall be as shown in MSS SP-69 Table 4 (Minimum Rod Diameter for Single Rigid Rod Hangers) and as indicated in Part 3 of these Specifications.

B. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing.

C. Rod material must be compatible with hanger and comply with above. Do not field cut thread on galvanized rod.

D. Do not use perforated strap.

E. Multiple Supports:
1. Horizontal banks of pipe may be supported on a common base member without regard to the pipe centerline elevation.
2. In the supporting of multiple pipe runs, provisions shall be made to keep the lines in their relative lateral positions, using clamps or clips as required. Lines subject to thermal expansion shall be free to roll axially or slide.

2.5 SADDLES AND SHIELDS

A. All Piping:
1. Saddle: MSS Type 39 Anvil Figure 160 -to 165.
2. Shield: MSS Type 40 (Anvil Figure 167), provide and install in accordance with Manufacturer's shield size selection tables.
3. The contour of the saddle shall match the radius of the pipe insulation.

2.6 BUILDING ATTACHMENTS

A. As indicated on the Drawings or in the Specifications.

B. Concrete Attachments:
1. Provide galvanized finish for all attachments used in wet or potentially wet areas.
2. Provide stainless steel bolts and nuts in wet and potentially wet areas.
3. Poured Concrete:
   a. Use cast-in-place inserts or bolted surface mounted attachments, at Contractor’s option.
   b. Expansion style anchors are not permitted on piping systems subject to vibration.
4. Precast Concrete Tees:
   a. Use fittings specifically designed for attachment to stems of precast tees.
   b. Drilling is not permitted except where specifically approved by Engineer and coordinated with precast Manufacturer to miss embedded, prestressed steel strands.
5. Precast Concrete Plank:
   a. Use toggle bolt attachment as indicated on Drawings.
   b. Alternatively, provide adhesive anchor, Hilti HY-20; or as approved.
   c. Drilling is not permitted except where specifically approved by Engineer and coordinated with precast Manufacturer to miss embedded, prestressed steel strands.

C. Horizontal Piping:
1. Steel W, I, or S shapes: MSS Type 23 clamp with retaining clip, (Anvil Fig. 88 and Fig. 89 for non-seismic and Fig. 89X for seismic applications) up to 2-inch; MSS Type 28 (Anvil Fig. 292) or MSS Type 21 (Anvil Fig. 133, 134) above 2-inch.
2. Steel Channel: MSS Type 20 universal channel clamp.
3. Bar Joists: Steel washer plate (Anvil Fig. 60).
4. Concrete: See "B" above.
5. Timber: Angle bracket and lag screws or as detailed on Drawings.
6. Steel Z Shapes: Custom attachment required.

D. In the absence of a Specification for a particular type of attachment, furnish attachments comparable in type and quality to that specified above for a similar situation.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. General Requirements:
1. The selection of hangers and supports shall be based on the overall design concept of the system and any special requirements which may be called for in these Specifications or as indicated on the Drawings. The support systems shall provide for, and control, the free or intended movement of the system including its movement in relation to that of the connected equipment. They shall prevent excess stress resulting from the transfer of weight being introduced into the system or connected equipment.
2. The selection of hangers and supports shall be made to provide the system with the degree of control that its operating characteristics require. Design hangers and supports to prevent sway and intendent movement.
3. The selection of hangers or supports will take into consideration the combined weight of the supported systems, including system contents.
4. Select and install hangers and supports to allow controlled thermal and seismic movement of system, to permit freedom of movement between anchors, and facilitate action of expansion joints, expansion loops, expansion bends and similar units.
5. The spans in MSS SP-69 Table 3 do not apply where concentrated weights, such as valves or heavy fittings, or where changes in direction of the piping occur between hangers.
6. Select all hangers and supports rated for the maximum potential loading with pipe full.
7. Select hangers for cold (less than 50 degrees F) piping service for installation over the insulation.
8. Where significant, vertical movement of pipe occurs at the hanger location a resilient support shall be used:
    a. Selection of resilient supports shall be based on permissible load variations and effects on adjacent equipment. Support selection for typical load variations are shown on MSS SP-69 Table 2 (Spring Support Selection). Load and movement calculations shall be made for the proper selection of spring hangers.
    b. Vertical movement and load transfer from riser expansion to horizontal runs shall be given consideration when applying spring hangers.
    c. Spring cushion hangers may be used where vertical movement does not exceed 1/4-inch and where formal load and movement calculations are not required.
    d. Variable spring hangers shall be used for all other resilient support requirements except as noted in the following paragraph.
    e. Constant support hangers shall be used on piping systems where the deviation in supporting force must be limited to 6% and which cannot be accommodated by a variable spring hanger.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. General:
1. Adjust all components as required for proper operation and required pipe slope.
2. Double nut all support rods at hangers.
3. Location and Routing:
    a. Install Piping as Indicated:
        1) On the Drawings.
        2) On the reviewed Shop Drawings.
    b. Secure Engineer's approval for all pipe routing changes.
4. Coordinate with other trades for placement of concrete attachments prior to concrete pouring.
5. Install all items in accordance with Manufacturer's instructions.

C. Horizontal Runs:
   1. General:
      a. Provide adequate supports for the loads with a factor of safety of at least 5 (400 pounds minimum).
      b. Provide protective shield at all hangers and rollers supporting plastic pipe and coated pipe.
      c. Support spacing not to exceed MSS SP-69 Table 3, or the requirements for seismic restraint, whichever is more stringent.
      d. Hanger rod diameter shall not be less than the requirements of MSS SP-69 Table 4, or the requirements for seismic restraint, whichever is more stringent.
   2. Bar Joists: Attachments to bar joists shall be made to top member and at panel points.

D. Ductile Iron Piping: The size of hanger components shall be suitable for the O.D. of the pipe to be supported.

3.3 INSULATION PROTECTION

A. Provide Protection Saddle:
   1. Equal to insulation thickness.
   2. At each hanger.
   3. For all insulated piping systems where longitudinal expansion exceeds 1-inch per 100 feet.

B. Provide insulation protection shield:
   1. At each hanger for all "cold" (less than 50 degrees F) piping services.
   2. In accordance with the following table:

Pipe Size (IPS)	Shield Gage	Length
5" and Smaller	16	12"
6" to 12"	12	16"
Greater than 12"	12	20"

   3. Installed as follows:
      a. Surround lower covering.
      b. Straddle equidistant on hanger.
      c. Flared at both ends as required to avoid damage to pipe covering, jacket and vapor barrier.

3.4 PAINTING

A. Touchup: Cleaning and touchup of painting of field welds, bolted connections and abraded areas of shop paint on miscellaneous metal are specified in Division 09 Section “Painting.”

B. Galvanized Surfaces: Clean welds, bolted connections and abraded areas. Apply galvanizing repair paint to comply with ASTM A780.

END OF SECTION

SECTION 23 07 19 – HVAC PIPING INSULATION

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 furnishing and installation of piping insulation.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Specifications:
      a. B209 - Aluminum and Aluminum Alloy Sheet and Plate.
      b. C533 - Calcium Silicate Block and Pipe Thermal Insulation.
      c. C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
      d. C547 - Mineral Fiber Preformed Pipe Insulation.
      e. C552 - Cellular Glass Block and Pipe Thermal Insulation.
   2. ASTM Standard Test Methods: E84 - Surface Burning Characteristics of Building Materials.
   3. National Fire Protection Association (NFPA) publications: NFPA 255 - Surface Burning Characteristics of Building Materials: 25, 50, 50 flame spread, fuel, smoke.
   4. ASHRAE: 90A - Energy Conservation in New Building Design, current edition.

1.4 SUBMITTALS

A. Manufacturer's Literature: For piping insulation.
   1. For Each Type Used:
      a. Name of Manufacturer.
      b. Details of construction and installation.
      c. Manufacturer's data (density, K-factor).
   2. For Each Application:
      a. Thickness.
      b. Total "R" value.
      c. Jacket material.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unbroken, brand marked containers or wrapping as applicable. Handle and store materials in a manner which will prevent deterioration and contamination with foreign matter.

B. Reject damaged, deteriorated, or contaminated material and immediately remove from the Site. Replace removed materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Insulation:
1. Pittsburgh-Corning.
2. Owens-Corning.
3. Certainteed.
4. Armacell.
5. Rubatex.
6. Knauf.
7. Johns Manville.

B. Jacketing (Aluminum or PVC):
1. Ceel-Co.
2. O'Brien.
3. Zeston.
4. Childers.
5. Pabco.

C. Adhesives:
1. Foster.
2. Childers.
3. Vimasco.
4. B.E.H.
5. Or approved equal.

2.2 TYPES OF INSULATION MATERIALS

A. Rigid Molded Glass Fiber – General (FG):
1. All-service jacket (ASJ) type factory applied jacketing.
2. 3 lbs/cu ft minimum density.
3. k factor of 0.23 at 75 degrees F mean.
4. 50 degree F service temperature.
5. Owens-Corning Type ASJ Max Pipe Insulation with SSL Max closure system; or equal.
6. Typical for application on pipes 16 inches and up.

2.3 INSULATION INSERTS

A. Insulation inserts shall be made of calcium silicate treated with water repellant.

B. Inserts shall be preformed for the pipe size, same thickness as adjoining pipe insulation, same length as shield, and 180 degree-minimum segments.

C. Insulation inserts shall not be less than the following lengths:
1. 2-1/2-Inch Pipe Size and Less: 10 inches long.
2. 3-Inch to 6-Inch Pipe Size: 12 inches long.
3. 8-Inch to 10-Inch Pipe Size: 16 inches long.
4. 12-Inch Pipe Size and Larger: 22 inches long.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install piping insulation:
   a. In conformance with the Drawings, these Specifications, and the Manufacturer's recommendations.
   b. Over clean, dry piping system.
   c. To the following thickness:
      1) As specified herein or as indicated on the Drawings.
      2) If not specified herein or indicated on the Drawings, in accordance with Manufacturer's recommendations for the specific application.
   d. Continuous through walls, ceilings and sleeves except at fire stops.
2. Fill all cracks and voids with insulating cement carefully troweled to leave a smooth finish.
3. Repair or replace insulation damaged by:
   a. Demolition.
   b. Making connections to piping or equipment.
   c. Water or mildew.
4. Insulate bundles of pipes out-of-doors with complete wrap of insulation 1-1/2 inches thick and of suitable diameter to contain bundle, with outer wrap.
5. Pipe Sizes 12-inch and Larger: Hold each 3-foot section of insulation in place with at least 3 separate loops of No. 14 AWG stranded annealed wire.
6. Verify that piping has been tested and cycled before applying insulation materials.
7. All sectional pipe covering shall be neatly and tightly applied with unbroken lengths and with the ends of the sections firmly butted together. Longitudinal joints shall be on the least conspicuous side of the pipe and slightly staggered. Fiberglass cloth or other coating shall be lapped over all joints and well pasted or cemented down in a neat and inconspicuous manner.
8. The insulation on piping shall be extended through all sleeves, anchor points and supports in order to produce a continuous application, and same shall be installed to conform to a uniform diameter.
9. All fittings, flanges, end caps, etc. on all lines, except where otherwise noted, shall be covered with insulated fitting covers. Thickness of insulation, jackets and finishes shall also match adjacent piping.
10. Secure calcium silicate pipe insulation with stainless steel bands.
11. Insulation for piping shall be continuous through hangers and supports.
12. Provide insulation inserts and insulation protection shields at hanger or support locations.
13. Valve bodies to the bonnet flange or union, drip legs, and pipes at anchor points shall be insulated. Terminate insulation into a finished end.
14. Terminate insulation into a finished end.

B. Joints and Fittings:
1. Insulate elbows, tube turns, sweeps and bends with mitered sections or premolded fittings. Match pipe covering material where used.
2. Fit joints tightly together.
3. Seal joints with sealing compound and preformed aluminum bands.

3.2 JACKETS AND FINISH

A. General:
1. Provide moisture barrier between the insulation and the jacketing in a continuous, unbroken seal.
2. Hold jacketing in place by a continuous sealed joint, providing a positive weatherproof seal along the entire length of the jacket.
3. Cap off ends with caps.
4. On cold lines, cut caps to the exact size of the pipe and seal with a recommended silicone calking.
5. Provide slip joints a minimum of every 25 feet or as needed for expansion.
6. Locate longitudinal jacket seams on indoor exposed piping out of view.

B. PVC:
1. Center a preformed strap (snap-strap) containing a permanently weatherproof plastic sealant over each circumferential joint and secure by tightening on a clip, or by use of a separate stainless steel banding.
2. Design snap-strap to take care of normal expansion.
3. Cover all pipe insulation and preformed insulation fittings.
4. Weld longitudinal seams together with welding adhesive as supplied by cover Manufacturer.
5. Overlap adjacent jacketing 3/4-inch and weld circumferential seams together with welding adhesive.
6. Overlap fitting covers to adjacent pipe insulation jacketing. Weld longitudinal and circumferential seams together with adhesive.

C. Attachment:
1. For systems operating at 50 degrees F and above: May be stapled using outward clinch staples spaced 3 inches apart at least 1/4-inch from the lap edge.
2. For systems operating below 50 degrees F: Vapor seal laps using self-sealing lap, lap seal tape gun or adhesive such as Benjamin Foster 520.

D. Taper and seal insulation ends regardless of service.

E. Fitting and pipe jackets to have matching finishes ready for painting.

F. For Insulation Without Factory Applied Jacket:
1. Finish with 8-ounce glass mesh and mastic.
2. Use breather mastic on piping operating at temperatures greater than 50 degrees F.
3. Use vapor barrier mastic on piping operating at temperatures less than 50 degrees F.

3.3 PIPING INSULATION APPLICATION SCHEDULE

A. Basis of Thickness Chart:
1. Thicknesses shown are based on products having a maximum "k" factor of 0.26 at a mean temperature of 75 degrees F.
2. These Thicknesses:
a. Can be reduced for products having significantly lower "k" values.
b. Shall be increased for products having higher "k" values in order to produce equivalent or greater thermal resistance.

B. Flame/Smoke Ratings: Local requirements for flame and smoke ratings must be met and may exclude some options listed herein.

C. Jackets and Finish Application:
1. Provide PVC jacket on exposed insulated piping within 7 feet of the floor.

D. Thickness Chart (In Inches):
1. Key: Insulation Type (Refer to Paragraph 2.2 of this Section):
a. FG = Rigid Fiberglass.
b. MF = Mineral Fiber.
c. CG = Cellular Glass.
d. CS = Calcium Silicate.
e. P = Phenolic.
f. E = Flexible Elastomeric.
g. PU = Polyurethane.

	PIPE SIZE						
Piping Systems Type	Temp (F) Range	Less Than 1″	1″ to 1-1/4″	1-1/2″ to 3″	4″ to 6″	8″ & Up	Type of Insulation *
Heating Water	180-250	1.5	1.5	2.0	2.0	2.0	FG

END OF SECTION

SECTION 23 20 19 – PIPING SPECIALTIES FOR HVAC

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 furnishing and installation of piping specialties.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Specifications:
      a. A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
      b. A216 - Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service.
      c. A193 - Alloy Steel and Stainless Steel Bolting Materials for High-Temperature Service.
      d. A278 - Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F.
   2. ANSI Standards:
      a. B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
      b. B16.5 - Pipe Flanges and Flanged Fittings.
      c. B16.24 - Bronze Pipe Flanges and Flanged Fittings, Class 150 and 300.
   3. ASME American Society of Mechanical Engineers:
      a. Boiler and Pressure Vessel Code - Section II.
      b. B31.1 - Power Piping.
      c. B31.5 - Building Services Piping.

1.4 SUBMITTALS

A. Manufacturer's Literature: For all items listed in PART 2 – PRODUCTS. Include dimensions, details of construction and installation, name of Manufacturer, and model.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

PART 2 - PRODUCTS

2.1 STRAINERS

A. Manufacturer: Armstrong, Mueller.

B. Type: "Y".

C. Screen: 20 mesh brass, removable.

D. Area: 5 times pipe diameter.

E. Pressure Rating: Match piping.

F. Install in front of each modulating valve, pressure regulating valve, and where indicated. Each strainer shall be equipped with a blow down valve and trap assembly, if on steam line.

2.2 MANUAL AIR VENTS

A. Manufacturer: Bell & Gossett or Dole.

B. Size: 1/8-inch.

C. Type: Slotted head (Bell & Gossett 4V or Dole No. 9).

D. Location:
1. All cabinet, unit heaters and air handler, and coils.
2. At all high points in the piping.
3. Wherever called for on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all piping specialties in conformance with:
1. The Shop Drawings reviewed by Engineer.
2. The Manufacturer's recommendation.

B. Furnish and install all vibration isolators, flexible connections, expansion joints, expansion loops required to reduce noise transmissions and stress on equipment and piping.

C. Cold spring all piping installed with expansion joints and loops half of the total expansion. This requirement does not reduce the amount of expansion compensation required of the loop or joint.

END OF SECTION

SECTION 23 21 13 – HYDRONIC PIPING

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 furnishing and installation of a hydronic piping and circulation system for heating hot water.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. American Society of Mechanical Engineering (ASME):
      a. B31.1 - Code for Pressure Piping.
      b. B31.9 - Code for Building Services Piping.
      c. Power Boiler Code.
      d. Heating Boiler Code.

1.4 SUBMITTALS

A. Manufacturer's Literature: For all products listed in Part 2.
   1. General:
      a. Dimensions.
      b. Details of construction and installation.
      c. Name of Manufacturer.
      d. Model number.
   2. Flow Measurement Devices:
      a. Flow and pressure drop curves.
      b. List each application with flow and size clearly indicated.

B. Operation and Maintenance Manuals: For all flow measurement devices.
   1. Equipment function, normal operating characteristics and limiting conditions.
   2. Assembly, installation, adjustment and checking instructions.
   3. Maintenance instructions.
   4. Guide to "troubleshooting".
   5. Parts lists and predicted life of parts subject to wear.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Except as otherwise indicated on the Drawings or specified herein, the manufactured units and flow measurement devices shall be supplied by one of the following:
   1. Amtrol (Expansion Tank).
   2. Apollo.
   3. Armstrong Pumps, Inc.
   4. Bell & Gossett.
   5. Caleffi.
   6. Deiterich Standard Corp. (Flow Indicators).
   7. Flow Design, Inc. (Circuit Setter).
   8. Nexus.
   9. Spirotherm, Inc.
   10. Taco, Inc.

2.2 PIPE AND FITTING APPLICATIONS:

A. General:
   1. Comply with Application requirements below.

B. Hydronic:
   1. For Piping Through 2-Inch to 75 psig:
      a. Pipe: Black Steel, Schedule 40, ASTM A53 or A106, ERW or seamless, Grade B.
         1) Fittings: Cast Iron, ASTM EB16.4, 150 pound.
         2) Joints: Screwed.
      b. Pipe: Seamless Copper, Type L, ASTM 1388:
         1) Joints: 95/5 Silvabrite Solder.
         2) Fittings: Wrought Copper.

2.3 VALVES

A. Provide in accordance with Division 23 Section “General Duty Valves for HVAC.”

2.4 FLOW MEASUREMENT DEVICES

A. Size:
   1. Select size to provide design flow at mid-range of scale.
   2. Do not use pipe size as basis of selection.

B. Circuit Setter (Flow Rates 2 gpm and Above):
   1. Manufacturer and Model:
      a. Bell & Gossett Model CB calibrated balancing valve.
      b. Armstrong Model CBV circuit balancing valve.
      c. Taco Model CS circuit setter.
      d. Flow Design Model AS Accusetter.
      e. Tour & Anderson Series 780.
   2. Bronze body construction with integral brass ball or globe valve, differential pressure readout ports and threaded drain connection.
   3. Rated for 300 psig/250 degree F operating conditions.
   4. Readout ports include caps and internal check valves.
   5. Furnish with calibrated name plate and memory stop.
   6. Furnish 1 Model RO-2 readout kit.
   7. Not acceptable for use as shutoff/isolation valve.

C. Circuit Setter (Flow Rates Less Than 2 gpm):
   1. Manufacturer and Model:
      a. Armstrong Model APV Venturi with a throttling ball valve.
      b. Flow Design Model AS Accusetter.
      c. Tour & Anderson Series 780.
   2. Bronze body construction with integral brass ball valve, venturi flow element, and differential pressure readout ports.
   3. Rated for 300 psig/250 degree F operating conditions.
   4. Readout ports include caps and internal check valves.
   5. Furnish with memory stop.
   6. Furnish 1 readout kit.
   7. Not acceptable for use as shutoff/isolation valve.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Install piping and circulation system in accordance with:
      a. The Drawing.
      b. These Specifications.
      c. The Shop Drawings reviewed by Engineer.
      d. The Manufacturer's recommendations.
   2. System shall not interfere with passage, head room or openings of doors and windows.
   3. Pipe: Straight, without rust or other defects.
   4. Joints:
      a. Screwed:
         1) Reamed after cutting and before threading.
         2) Sharp, clean threads.
         3) Use pipe compound on male threads only.

B. Mains and Branches:
   1. Install above the ceiling and in bar joists, above bottom chord, as indicated on the Drawings.
   2. Sizes as indicated on the Drawings.
   3. Install Tops of Mains Level:
      a. Use eccentric fittings at changes in pipe size.
      b. Provide adequate supports to prevent air pockets.
   4. Branches:
      a. Take off bottom of main.
      b. Provide swing connection before vertical riser to a heating unit or convector.

C. Risers and Vertical Pipes: Plumb, straight and without unnecessary fittings or offsets.

D. Fittings:
   1. Provide Air Vents:
      a. As indicated on the Drawings.
      b. At all high points on the system.
   2. Provide Drain Valves:
      a. At the bottom of all risers.
      b. At boiler.
      c. At all low points.
   3. Provide insulating couplings or unions where copper and steel pipes are joined.
   4. Provide unions at all valves and at all equipment for making repairs.

E. Valves:
   1. Provide Shutoff Valves:
      a. On both sides of all pumps where necessary to ensure proper operation of the system.
      b. On all branches at the main.
      c. So that equipment can be serviced without shutting down the system.
   2. Provide unions at all valves and at all equipment for making repairs.

END OF SECTION

SECTION 23 82 00 – UNIT HEATERS

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, but is not necessarily limited to, the furnishing and installation of the major items listed: unit heaters.

1.3 SYSTEM DESCRIPTION

A. All terminal heat transfer equipment shall be as indicated on the Drawings.

B. Manufacturer name and model number information given in equipment schedules represent quality and performance standards for that equipment.

C. Design performance for terminal heat transfer is based on the following:
1. Heating:
    a. 60 degrees F entering air temperature.
    b. 140 degrees F entering water temperature.

1.4 SUBMITTALS

A. Manufacturer's Literature: For all equipment specified herein.
1. General:
    a. Dimensions.
    b. Details of construction and installation.
    c. Name of Manufacturer.
    d. Model.
2. For Each Device:
    a. Identify by equipment schedule tag number.
    b. Design capacity.
    c. Color.
    d. Electrical characteristics and project specific wiring diagrams including controls wiring..
    e. List of accessories furnished.

B. Operation and Maintenance Manuals: For powered equipment.
1. Equipment function, normal operating characteristics and limiting conditions.
2. Assembly, installation, alignment, adjustment and checking instructions.
3. Operating instructions for start-up, routine and normal operating, regulation and control, and shutdown and emergency conditions.
4. Lubrication and maintenance instructions.
5. Guide to "troubleshooting".
6. Parts lists and predicted life of parts subject to wear.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
1. Trained and experienced in the fabrication and installation of the materials and equipment.
2. Knowledgeable of the design and the reviewed Shop Drawings.

B. Manufacturer Qualifications: Regularly engaged in production of such equipment.

PART 2 - PRODUCTS

2.1 UNIT HEATERS

A. Manufacturers:
1. Vulcan.
2. Trane.
3. Modine.
4. Rittling.

B. Casing: 18 gage steel threaded connections for hanger rods and bonderized baked enamel finish.

C. Heating Element:
1. Seamless copper tubing, 0.025-inch minimum wall thickness.
2. Silver brazed to steel headers.
3. Evenly spaced aluminum fins mechanically bonded to tubing.
4. Tested with air under water at 200 psi.

D. Fan:
1. Direct drive propeller type.
2. Statically and dynamically balanced.
3. Complete with fan guard.

E. Air Outlet:
1. Adjustable pattern diffuser on projection models.
2. 4-way louvers on horizontal throw models.

F. Motor:
1. Totally enclosed, permanently lubricated and resiliently mounted.
2. Motor rated at 1/8 hp and below shall have internal overload protection.

G. Provide with line voltage thermostat. Refer to Drawings for control sequence.

H. Provide with single phase motor starter.

PART 3 - EXECUTION

3.1 INSTALLATION

A. In accordance with Manufacturer's installation instructions and installation details indicated on Drawings.

B. Thoroughly clean all exposed equipment pieces.

C. Vacuum clean all heating/cooling elements prior to job acceptance.

3.2 COORDINATION

A. Coordinate with Electrical Subcontractor for power supply and disconnect to units.

END OF SECTION

SECTION 26 00 10 – ELECTRICAL GENERAL PROVISIONS

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 furnishing and installation of a complete electrical system.

1.3 SYSTEM DESCRIPTION

A. Work Included:
   1. This Division includes all labor, materials, and equipment, tools, supervision, start-up services, Owner's instructions, including all incidental and related items necessary to complete installation and successfully test and start-up and operate in a practical and efficient manner all electrical work and systems indicated on Drawings and described in each Section of Division 26 and conforming with all Contract Documents.
   2. This Section defines certain terms used in the Specifications and explains the language, abbreviations thereof, format and certain conventions used in the Specifications and associated Contract Documents.
   3. The following are not intended to supersede but to clarify the definitions in the General Conditions, the Supplementary Conditions, and Division 01.

B. Temporary Facilities: Provide temporary facilities in accordance with Division 01 Section “Temporary Facilities and Controls.”

C. Site and Contract Documents Examination: Submission of a Bid is considered evidence Contractor has visited Site, examined Drawings and Specifications of all trades, and is fully informed with all Project and Site conditions, and is proficient and experienced and knowledgeable of all standards, codes, ordinances, permits, and regulations which affect every trades' completion, cost and time required, and that all costs are included in their Bid.

D. Responsibility:
   1. Contractor shall be responsible for all subcontractors and Suppliers, and include in their Bid and apportion all materials, labor, and equipment to several trades involved in accordance with all local customs, rules, regulations, jurisdictional awards, decisions and secure compliance of all parts of Specifications and Drawings regardless of Sectional inclusion in these Specifications.
   2. Each electrical subcontractor and sub-subcontractor shall be responsible for all parts applicable to their trade in accordance with Specifications and Drawings and for coordinating locations and arrangements of Contractor’s work with all other relevant Specifications, Drawings, Shop Drawings, and details.

E. Demolition:
   1. Contractor shall be responsible to remove and/or relocate any electrical equipment in conflict of new construction.
   2. Determination by Owner shall be made concerning all items to be removed from Project as to if Owner shall keep or if Contractor is to remove from Site.

F. Drawings and Specifications:
   1. Drawings and Specifications are intended to supplement each other and all work specified or indicated in either shall be provided.
   2. Drawings are diagrammatic and indicate general arrangement of systems and work included in Contract and shall serve only as design drawings and not as working drawings for general layout of various equipment and systems. Drawings do not necessarily indicate every required junction box, pull box, off-set, mounting support, access panel, etc., which shall be provided as required.

3. Each Contractor shall examine all Drawings and Specifications of their trade and work of Drawings, Shop Drawings, and field layouts of all other trades on the Project, including Architectural, structural, mechanical and electrical. If any discrepancies occur between these various Drawings or between these Drawings and these Specifications, Contractor shall report same to Engineer in writing and obtain written instructions for changes in construction. Should interferences develop during construction which cannot be avoided, Engineer shall decide which work is to be relocated regardless of which was first installed. This work shall be done at no extra cost to Owner.
4. Should Drawings disagree in themselves or with Specifications, the better quality or greater quantity of work shall be provided.
5. All schedules on Drawings and Specifications are only for convenience of Contractor. Contractor shall make their own count and where fixtures or equipment are indicated on Drawings but not on schedule, provide like equipment or fixtures for like rooms or use.
6. Manufacturer's Model Number:
    a. Wherever on Drawings or in Specifications that a Manufacturer's catalog number or model or type designation is made, it is intended as a general qualification and it is Contractor's responsibility before ordering, to determine the proper type or model with arrangement, mounting, and accessories applicable for each location on the Project.
    b. Approval of Shop Drawings by Engineer will not obviate Contractor's responsibility.
7. Drawings shall not be scaled for measurement and shall not serve as Shop Drawings.

G. Definitions:
1. Furnish: Supply and deliver to Project Site, ready for unloading, unpacking, assembly, installation, and similar subsequent requirements.
2. Install: Operations at Project Site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, protection, cleaning, and similar requirements.
3. Provide: Furnish, install, test, and place in working order, complete and ready for intended use.
4. Minimum Requirements:
    a. Indicated requirements are for a specific minimum acceptable level of quality and quantity as recognized in the industry. Actual work must comply, within specified tolerances, or may exceed minimums within reasonable limits.
    b. Refer uncertainties to Engineer before proceeding.
5. Abbreviations, Plural Words:
    a. Abbreviations, where not defined in Contract Documents, will be interpreted to mean the normal construction industry terminology determined by recognized grammatical rules by Engineer.
    b. Plural words will be interpreted as singular and singular words will be interpreted as plural where applicable for context of Contract Documents.
    c. "In conformity herewith" "shall be" "as noted or indicated on Drawings" "according to Drawings" "a" "the" "and" "all", etc., are omitted in places but shall be supplied by inference.
6. Raceway: Conduit, wireway, channels, boxes, fittings, hangers, supports, and items necessary or required in connection with or relating to raceway to provide a complete installation.
7. Concealed: Embedded in masonry or other construction below floor slabs, installed behind wall furring, within double partitions of hung ceiling, in trenches, tunnels or crawl spaces.

H. Substitution and Changes:
1. Substitutions and changes shall be in accordance with Division 01 Section “Product Substitution Procedures.”
2. When a material, method or product is listed by trade names or catalog number for one use, it is basis of design. Other Manufacturers are listed as acceptable providing specific item is comparable with basis and intent of design.
3. Contractor and/or equipment supplier may propose other materials, methods or products of equal quality, function, durability, and appearance. Proof of equality must be submitted to Engineer at least 10 days prior to due date for Bids and, if approved, an Addendum naming the material or product so approved will be issued to all Bidders prior to Building. Acceptance and approval is responsibility of Engineer.
4. Contractor is liable for all added costs to himself or others and is responsible for verifying adequate available space for variations in dimensions, clearance, weight, and roughing-in requirements when product not named as basis of design is used and is responsible for advising all other trades of variations and, when requested shall submit revised drawing layout for approval of Engineer.

1.4 QUALITY ASSURANCE

A. Qualifications: Compliance with standard codes and permits shall be in accordance with the General and Supplementary Conditions.

B. Regulatory Agencies Requirements: All work under Division 26 shall comply with latest edition of applicable standards and codes of following:
1. NEC (NFPA 70), National Electric Code.
2. AWS Standards for welding.
3. ANSI C2, National Electrical Safety Code.
4. ANSI C73, Dimensions of Attachment Plugs and Receptacles.
5. NECA Standards for installation.
6. NEMA Standards for materials and products.
7. ASTM American Society for Testing Materials.
8. ASA American Standards Association.
9. NFPA National Fire Protection Association.
10. UL Underwriters' Laboratories, Inc.
11. OSHA Occupational Safety and Health Act.
12. Ohio Building Codes.
13. UBC Uniform Building Code.
14. Americans With Disabilities Act (ADA).

C. All labor, materials, and equipment shall comply with all applicable:
1. City, county, and state laws, ordinances, codes, and regulations.
2. Ohio and County Department of Health.
3. Applicable fire marshal's office.
4. Federal specifications.

D. Excess Quantities and Sizes: Where quantities, sizes or other requirements on Drawings or Specifications are in excess of code requirements, Drawings or Specifications govern.

E. Conflicts: When conflicts exist between referenced Specifications or standards, more stringent requirements govern. No extra compensation for such compliance allowed.

F. Notices and Payments: Contractor shall give all notices, file all Drawings, obtain necessary approvals, obtain all permits, pay all fees, deposit and expenses required for installation of all work under this Contract. Within 10 days after the contract award, Contractor shall show proof that permits have been obtained and fees paid.

G. Inspections and Certificate of Inspection:
1. No work shall be covered or enclosed until work is tested in accordance with applicable codes and regulations and successful tests witnessed and approved by authorized inspection authority.
2. Provide to Engineer's office evidence that the installation has been inspected and approved by authorized governmental inspector having jurisdiction over that phase of work involved.

H. UL Labels: In general, all material where applicable shall be labeled or listed by Underwriter's Laboratories, Inc.

1.5 COORDINATION OF ELECTRICAL WORK

A. Coordination: Advise other trades of openings required in their work for the subsequent move in of large units of electrical work (equipment).

B. Locations: Locate operating and control equipment properly to provide easy access and arrange entire electrical work with adequate access for operation and maintenance. Allow for clearance around equipment in accordance with NEC.

1.6 SUBMITTALS

A. General: Shop and installation drawings shall serve the purpose of checking Contractor's interpretations of the design Drawings and Specifications, aid in correlation and coordination of the various trades and be used by Contractor's field personnel as installation instructions. Rough-in and connections to equipment furnished by this Contractor or by other trades shall be according to Shop Drawings, furnished for this equipment. Contractor shall coordinate all their work with various other trades and check these Shop Drawings before installing services.

B. Schedule of Equipment and Subcontractors:
1. Submit to Engineer for approval 1 electronic copy of schedule of all equipment and materials on which Bid is based, including all items being provided by all Subcontractors.
2. After schedule of Equipment and Subcontractors is approved, no deviation will be permitted without written consent of Engineer.

C. Shop Drawings Include the following:
1. After schedule of Equipment and Subcontractor is approved, submit 1 electronic copy of Shop Drawings on all equipment and materials. Shop Drawings shall be submitted bound and separated, forming booklets containing one drawing of each item. Mark clearly on the cover which project these drawings pertain to. Mark each drawing with the corresponding marking by which the item is listed on the Drawings.
2. Shop Drawing submittals shall include signatures of Contractor and electrical Subcontractor certifying they have inspected submittal as to substantial compliance with Contract Documents, space allowance for installation and service, and work of other trades. Submittals not complying with the above will be returned unchecked.
3. Submit complete Manufacturer's Shop Drawings of all equipment, accessories, and controls, including dimensions, weights, capacities, construction details, installation, operating, and maintenance instructions, controls and wiring diagrams; all applicable Manufacturers' warranties; and all details involving other trades.
4. Itemize required accessory items not specifically included in submittal being provided on separate submittal.
5. Submittals containing items not applicable to Project must be distinctly and completely identified.
6. General catalog cuts without detailed Engineering and installation details will not be accepted.
7. Engineer's approval of Shop Drawings is a service only and not considered as a guarantee of compliance with or as relieving Contractor of basic responsibilities under Contract Documents and does not approve changes in time or cost.
8. After approval, Contractor shall provide information to all affected trades.

D. "As-Built" Drawings: Provide one set of redlined "as-built" drawings to Engineer at the completion of the project.

E. Extra Copies of Submittals: Refer to "Final Acceptance, Guarantees, and Warranties" item in this Section for requirements of extra copies of Shop Drawings and operating and maintenance information.

1.7 DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Delivery, storage, handling, and protection shall be in accordance with the General and Supplementary Conditions, and in accordance with each Division 26 Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Product Listing:
1. Prepare the product listing for electrical work, separately from the listing(s) of products for other work.
2. Include listing of each significant item of equipment and material used in the work and indicate the generic name, product name, Manufacturer, model number, related specification section number(s), and estimated date for start of installation.

3. Materials such as conductors, conduit, and boxes taken from installer's stock need not be listed.
4. For principal equipment items, list the input/output ratings.
5. Submit list within 14 days of contract date.

B. Compatibility:
1. Provide products which are compatible with other products of the electrical work and with other work requiring interface with the electrical work, including electrical connections and control devices.
2. For exposed electrical work, coordinate colors, and finishes with other work.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

A. General:
1. Perform cutting and patching in accordance with Division 01 Section “Cutting and Patching”, and this Section.
2. Except as individually authorized by Engineer, cutting and patching of electrical work to accommodate the installation of electrical work is not permitted.

3.2 CONCRETE FOR ELECTRICAL WORK

A. Refer to Division 03 “Cast-in-Place Concrete” for requirement on concrete for electrical work.

3.3 PAINTING ELECTRICAL WORK

A. Except as otherwise indicated, comply with the applicable provisions of Division 09 Section “Painting”, for painting of electrical work.

3.4 ELECTRICAL WORK CLOSE-OUT

A. General: Except as otherwise indicated in this Section, close-out shall be in accordance with Division 01 Section “Closeout Procedures”.

B. Coordination with Mechanical:
1. Coordinate close-out operations with close-out of mechanical systems and other power consuming equipment.
2. Accurately record locations of conductors which are underground or otherwise concealed.
3. Test run electrical equipment in coordination with test runs of mechanical systems.
4. Clean and lubricate operational equipment.
5. Check all fuses and thermal overload units for proper sizing as per load, as determined in the field.
6. Instruct Owner's operating personnel thoroughly in the operation, sequencing, maintenance, and safety/emergency provisions of the electrical systems.
7. Turn over the operations to Owner's personnel at the time(s) of Substantial Completion.
8. Until the time of final acceptance of the total Work of the Contract, respond promptly with consultation and services to assist Owner's personnel with operation of electrical systems.

END OF SECTION

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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. Excess Quantities and Sizes: Where quantities, sizes or other requirements on Drawings or Specifications are in excess of code requirements, Drawings or Specifications govern.

C. Conflicts: When conflicts exist between referenced Specifications or standards, more stringent requirements govern. No extra compensation for such compliance allowed.

1.2 SUMMARY

A. This Section includes the following:
1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with
1. NECA 1 - Standards Practices for Good Workmanship in Electrical Construction.
2. NEC – National Electrical Code (NFPA 70).

1.4 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.5 SUBMITTALS

A. Product Data: For sleeve seals.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration, damage, contamination with foreign matter, and damage by weather or elements, and according to Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, weather tight wrapping.

D. Reject damaged, deteriorated or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

1.7 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To ensure that mounting heights and locations of electrical equipment do not interfere with all other building appurtenances such as, but not limited to, containment areas, special coatings, and other equipment.
   3. To allow easy access and disconnection of electrical equipment while ensuring the least amount of interference with other installations.
   4. To allow right-of-way for piping and conduit installed at required slopes.
   5. To ensure that connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and outside of the dedicated working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.
   1. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
      b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. Metraflex Co.
      d. Pipeline Seal and Insulator, Inc.
      e. Proco Products, Inc.
   2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
   3. Pressure Plates: Plastic.
   4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonshrink; recommended for interior and exterior for sealing openings in non-fired-rated walls or floors.

B. Standard: ASTM C1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5,000 psi, 28 day compressive strength.

D. Packaging: Premix and factory packaged.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1 and NEC.

B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in a manner as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2-inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless otherwise indicated on the Drawings.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL SYSTEM INSTALLATION

A. Install sleeve-seal systems onto sleeves of exterior concrete walls and slab-on-grade at raceway entries into buildings.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping Systems."

3.5 DUCT SEAL INSTALLATION

A. Install duct seal materials in strict accordance with the Manufacturer’s instructions.

B. Obtain approval from Engineer prior to installing duct seal as the application may require duct seals and plugs to be utilized in lieu of duct seal.

3.6 DUCT SEALS AND PLUGS INSTALLATION

A. Where conduits penetrate into the building, seal duct openings at conduit termination points with duct seals and plugs for all conduits entering the building to prevent migration of water and gases into the building and to prevent the condensation of water vapor inside the enclosures where the conduits terminate.

B. Duct seals and plugs shall be applied after all cables have been installed.

C. Install duct seals and plug materials in strict accordance with the Manufacturer’s instructions.

D. Where conduit will be simultaneously exposed to different temperatures, such as where it passes through the outside wall of a heated building or between two different rooms, the inside of the conduit shall be sealed with duct seals and plugs.

E. All raceways that penetrate in to or out of manholes, vaults, buildings, freezers, coolers, roofs, or like installations shall require duct seals and plugs to be installed,

F. All open-ended riser conduits shall require duct seals and plugs to be installed.

END OF SECTION

SECTION 26 05 20 – CONDUCTORS AND CABLES – 600V AND BELOW

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 furnishing and installation of all electrical conductors, cables, splices, and connectors.

B. Major Systems Include:
1. 600V and below service entrance, feeders and electrical distribution.
2. Branch circuit wiring.
3. System wiring.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the standards of the following organizations as applicable to materials, construction and testing of wire cables:
1. NEMA - National Electrical Manufacturer Association Standards.
2. IEEE Standards.
3. Insulated Cable Engineers Association - Standards.
4. ASTM Standards.
5. NEC - National Electric Code

1.4 SUBMITTALS

A. Product Data: For each type of product.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
1. Trained and experienced in the fabrication and installation of the materials and equipment.
2. Knowledgeable of the design and the reviewed submittals.

B. Manufacturers: Firms regularly engaged in the manufacture of electrical conductor and cable products of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping.

D. Reject damaged, deteriorated, or contaminated materials and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Except as otherwise indicated, provide conductors, cables, and connectors of Manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by the Manufacturer and as required for the installation.

B. Power Wire:
1. All conductors and cables shall be new with a minimum wire size of No. 12 AWG. Manufacturer's name, type, and size shall be permanently marked on the outer covering at regular intervals and delivered in complete coils or reels.
2. Provide factory fabricated conductors of size, rating, material, and type as indicated for each service. Where not indicated, provide proper selection as determined by installer to comply with installation requirements and with NEC standards, from only following types and conductors:
   a. Type THHN/THWN, 600 Volt, 75/90 Degrees C Rated with Nylon Jacket: Stranded copper for all sizes.
   b. Bare Conductors: Stranded copper for all sizes.

C. Metal Clad (Type MC) Cables:
1. Type THHN/THWN insulated copper conductors, with insulated green grounding conductor routed with the circuit conductors.
2. High strength, lightweight, galvanized steel flexible interlocking armor, UL listed and labeled for UL Standards 1569 and 83.
3. Thermoplastic insulated bushing for each cable end.
4. Manufacturers: MCTUFF Lightweight Steel MC Metal Clad Cables by AFC Cable Systems; or equal.

D. Control Cable: No. 14 AWG minimum, type THHN/THWN.

E. Power Wiring Cable Accessories: For Connectors:
1. Wing nuts by Ideal.
2. Sta-Kon by Thomas & Betts.
3. Scotchlox Spring by Minnesota Mining & Manufacturing Company.
4. Compression Type 53200 by Thomas & Betts.
5. Hydent by Burndy.
6. Insulated multi-cable mechanical connector blocks by Polaris, or Ilsco.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install electrical conductors, cables, and connectors as indicated on the Drawings, in accordance with the Manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation," and in accordance with recognized industry practices to ensure that products serve the intended functions.
2. Conductors and cables shall be sized in accordance with the Drawings or, in the absence thereof, in accordance with NEC requirements. Except where indicated herein, conductor sizes greater than No. 12 AWG are indicated on the Drawings.
3. Provide a dedicated grounded conductor (neutral) for each circuit that requires a neutral for proper operation. Unless indicated otherwise on the Drawings, shared neutrals are not allowed.
4. Provide an equipment grounding conductor in all raceways. Conductor shall be sized in accordance with the National Electrical Code.

B. Voltage Drop Compensation:
   1. Provide No. 10 AWG conductors in lieu of No. 12 AWG conductors to compensate for voltage drop as follows:
      a. For each 277V, 20 ampere branch circuit that exceeds 200 feet in length between the branch circuit panelboard and the last outlet.
      b. For each 120V, 20 ampere branch circuit that exceeds 100 feet in length between the branch circuit panelboard and the last outlet.
   2. When conductor size is increased to compensate for voltage drop, provide equipment grounding conductor increased in size in accordance with NEC.

C. Installation Procedures:
   1. Each conduit shall be free of moisture and debris before conductors are installed.
   2. Remove moisture from conduits by swabbing.
   3. Install conductors so insulation is not damaged. Replace all conductors that are damaged.
   4. Install conductors and cables only in code conforming raceway.
   5. Pull conductors together where more than 1 conductor is being installed in a raceway.
   6. Use manufacturer-approved pulling compound or lubricant, where necessary. Compound shall not deteriorate conductor and insulation. Compounds shall be UL listed.
   7. Use a pulling means, including fish tape, cable or rope, and basket-weave wire/cable grips, that will not damage the raceway or the wire.
   8. Keep conductor splices to a minimum.
   9. Install splices and taps which have equivalent or better mechanical strength and insulation as the conductor.
   10. Use splice and tap connectors which are compatible with the conductor material.
   11. Make all joints, splices, and connections only at accessible junction or outlet boxes, never inside conduit or fitting. Make splices in No. 10 AWG and smaller wire with insulated spiral mechanical connectors.
   12. Make splices in No. 8 AWG and larger copper wire with compression type mechanical connectors.
   13. Insulate all joints at splices with "Scotch" brand electrical pressure sensitive tape to 150% of conductor insulation value.
   14. Make conductor length for parallel feeds identical.
   15. Do not install exposed cables. Where cables need to run in exposed areas, install in surface-mounted raceway.
   16. Do not lace, strap or tie feeder or branch circuit conductors together in panels, switchboards, variable speed drives, motor control centers, automatic transfer switches, boxes, and wireways.
   17. Feeders entering electrical equipment shall be adequately secured with cable cleats.
   18. Use color coded conductors as follows:
      a. Phases: Black-red-blue (under 150V to ground).
      b. Phases: Brown-orange-yellow (over 150V to ground).
      c. Neutral: White identified (feeders); White (branch circuits).
      d. Ground: Green identified (feeders); Green (branch circuits).
   19. Support conductors in vertical raceways in accordance Division 26 Section “Hangers and Supports for Electrical Systems.
   20. Lights shall be grouped on circuits as indicated on the Drawings. Different types of circuits such as branch circuits and control circuits, shall not be mixed in common conduit runs, but shall be run separately, although more than 1 circuit of the same system may be run in common conduit runs.
   21. Conductor ampacity derating shall be adhered to for all conductors in accordance with the National Electrical Code.
   22. Type MC cable may only be used for fixture whips above dropped ceilings, from junction boxes to individual lighting fixtures, and in existing walls and ceilings. Type MC cable shall originate from accessible junction boxes above ceilings.

3.2 FIELD QUALITY CONTROL

A. General:
   1. Prior to energization, check conductors and cables for continuity of circuitry and for short circuits. Correct malfunctions when detected.
   2. Subsequent to conductor and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION

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SECTION 26 05 27 – GROUNDING AND BONDING

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 furnishing and installation of a complete and continuous grounding system.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

A. All equipment, raceway systems, interior wiring, systems with neutrals, and motorized equipment shall be grounded.

1.4 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design.

B. Grounding system shall be in accordance with the current National Electrical Code (NEC).

C. Grounding system, connectors and clamps shall be UL labeled.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: A portion of the required materials for grounding systems are specified in the Division 26 – Electrical Sections.

PART 3 - EXECUTION

3.1 DISTRIBUTION SYSTEM GROUNDING

A. Provide a green, insulated, equipment grounding conductor in each raceway (metallic and non-metallic; rigid and flexible). Equipment grounding conductors shall be sized in accordance with Article 250 of the NEC.

B. Circuit Grounding: Install grounding bushings, grounding studs, and grounding jumpers at panelboards and all like equipment.

C. Bonding Jumpers:
   1. Provide green insulation, size correlated with overcurrent device protecting the wire, attached to grounding bushings on conduits, to lugs on boxes, and other enclosures.
   2. Bond to neutral only at service neutral bar.

D. Metallic Conduit: When bare grounding electrode conductors are enclosed in metallic conduit, the conduit shall be bonded to the grounding electrode conductor(s) at both ends utilizing equipment UL listed for this purpose.

E. Expansion Joints: Provide a bonding jumper around expansion fittings in metallic conduit to maintain ground continuity. Expansion fittings may include an internal bonding jumper constructed of a tinned copper braid, sized to meet UL fault current test requirements and complying with the bonding requirements of Article 250 of the NEC.

END OF SECTION

SECTION 26 05 29 – HANGERS AND SUPPORTS 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 the furnishing and installation of the following: Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

A. Electrical Supports: Angles, channels, brackets, and mounting accessories for supporting all conduit, luminaires, switches, and other electrical equipment which are hung or mounted above floor.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. This Section defines general criteria for the selection and installation of supporting devices, but does not cover all types specifically required for the Project.

B. Choose or design supporting devices in accordance with these general criteria.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
1. Trained and experienced in the fabrication and installation of the materials and equipment.
2. Knowledgeable of the design and the reviewed submittals.

B. Regulatory Agencies Requirements:
1. Provide supporting devices listed by Underwriters' Laboratory for their application as installed.
2. Comply with National Electrical Code (NFPA 70) as applicable to construction, installation, and requirements for supporting devices.
3. Comply with Metal Framing Manufacturers Association Standard Publication (MFMA-4); factory-fabricated components for field installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer’s directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping.

D. Reject damaged, deteriorated, or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conduit Supports:
1. Where information indicated on Drawings conflicts with information herein, the more stringent requirements shall take precedence and the better quality or greater quantity of work shall be provided.
2. Single Runs: Galvanized conduit straps or ring bolt type hangers with spring clips. Do not use plumber's perforated straps.
3. All supports, such as, but not limited to, metal channel (strut) framing systems, angles, straps, hangers, etc. shall match the raceway type that is being supported. For example, galvanized conduit requires galvanized metal channel (strut) framing systems and straps, PVC coated conduit requires PVC coated metal channel (strut) framing systems and straps, PVC conduit requires PVC channel (strut) framing systems and straps.
4. In general, all hardware, such as anchors, nuts, bolts, washers, threaded rod, etc. shall match the conduit type: Galvanized steel hardware shall be used with galvanized steel rigid metal conduit; 316 stainless steel hardware shall be used with PVC and PVC coated rigid metal conduit.
5. Multiple Runs: Conduit rack with 25% spare capacity.
6. Vertical Runs: Channel support with conduit fittings.
7. Manufacturers:
   a. Cooper B-Line; a division of Eaton Corporation.
   b. ERICO International Corporation.
   c. Power-Strut; Power Engineering Co., Inc.
   d. GS Metals Corp.
   e. Michigan Hanger Co., Inc.; O-Strut Div.
   f. National Pipe Hanger Corp.
   g. Thomas & Betts Corporation.
   h. Unistrut; a brand of Atkore International, Inc.
   i. Wesanco Channel Systems; ZSi-Foster, Inc.

B. Mounting, Anchoring, and Attachment Components
1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials where used. See item 2.1 A 5 above for clarification.
2. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used. Power-actuated fasteners may only be used after receiving written approval from Architect.
3. Manufacturers:
   a. Hilti, Inc.
   b. ITW Construction Products.
   c. MKT Fastening, LLC.
   d. Or equal.

C. Supports for Conductors in Vertical Conduit:
1. Install in compliance with NEC article 300.19.
2. Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads.
2. Secure Engineer's approval before welding or bolting to steel framing or anchoring to concrete structure.
3. Where equipment is to be suspended from cast-in-place concrete construction, set approved concrete inserts in formwork to receive hanger rods. Where equipment is to be suspended from metal deck and beam or joist construction, support equipment from beams or joists only.
4. Existing supports may only be used where they meet the requirement in this Specification.

END OF SECTION

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SECTION 26 05 34 – 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 the furnishing and installation of conduits and fittings for electrical wiring.

1.3 SUBMITTALS

A. Product Data:
   1. For surface raceways, wireways and fittings.
      a. Name of Manufacturer.
      b. Model number.
      c. Details of construction and installation.
      d. Electrical specifications and ratings.
      e. Dimensional data.
      f. Color and finish.

1.4 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design.

B. Regulatory Agencies Requirements:
   1. ACI – American Concrete Institute: Standards pertaining to conduits embedded in concrete (Section 6.3 in ACI 318 – Building Code Requirements for Structural Concrete and Section 6.3 in ACI 350R – Environmental Engineering Concrete Structures.)
   2. NEMA – National Electrical Manufacturer's Association – Standards pertaining to raceways.
   3. NEC – National Electric Code – As applicable to construction and installation of conduit system.
   4. Provide conduit which is listed and labeled by Underwriters' Laboratories.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner that will prevent deterioration or damage (e.g., bending, end damage, finish scoring), contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping. Provide color coded end cap thread protectors on exposed threads of threaded metal conduit.

D. Reject damaged, deteriorated, or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rigid Metal Conduit (RMC): Galvanized Steel RMC: Galvanized steel, heavy wall conduit with threaded fittings, 3/4-inch trade size minimum, insulated bushings.

B. Electrical Metallic Tubing (EMT):
   1. Thin wall, hot galvanized, steel tubing, 3/4-inch trade size minimum with insulated throat steel connector.
   2. Fittings: Steel Compression or setscrew type (die cast fittings are expressly prohibited).

C. Surface Metal Raceway (SMR):
   1. One-piece steel raceway with a factory assembled base and cover with associated fittings. Finish shall be tough, durable, and scratch-resistant, suitable for field painting. Type and Manufacturer: V500, ivory or V700, ivory surface metal raceway as manufactured by Wiremold; or equal.
   2. UL listed.
   3. Fittings, couplings, junction boxes, and accessories as required. Color to match raceway.

D. Flexible Metal Conduit (FMC): 3/4-inch trade size minimum with galvanized steel flexible conduit insulated throat steel connectors.

E. Liquid Tight Flexible Metal Conduit (LTFMC): 3/4-inch trade size minimum. Flexible conduit with flexible, moisture-proof PVC jacket and liquid tight connectors.

F. Seal-off Fittings:
   1. Malleable iron with zinc electroplated finish.
   2. Threaded for connection of RMC.
   3. Provide sealing compound and fiber as required.

G. Joint Compound for RMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

H. Conduit Hubs for RMC:
   1. Suitable for environment served.
   2. Grounding screw.
   3. O-ring gasket.
   4. Material: Malleable Iron with zinc electroplate.
   5. Manufacturer:
      a. Cooper Myers Hubs.
      b. Thomas & Betts.
      c. Killark.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unless otherwise specified or indicated on the Drawings, conceal conduit to the extent possible.
   1. In finished areas where conduit cannot physically be concealed due to existing conditions, provide surface metal raceway. Finished areas are generally, but not always: above grade, heated spaces with finished walls (e.g., painted, drywall, etc.), finished floors (e.g., painted concrete, carpet, tile, etc.), and finished ceilings (e.g., drywall, suspended ceiling grids, wood, etc.).
   2. Conduit shall not be concealed within slabs, or ceilings.

B. Exposed conduit permitted in:
   1. MC cable is not permitted in this application.
   2. Service equipment rooms.
   3. Rooms without finished ceilings (overhead only).
   4. Unfinished rooms.

C. Install conduit products in accordance with:
   1. The Drawings.
   2. The Manufacturer's written instructions.
   3. Applicable requirements of NEC and National Electrical Contractors Association's "Standard of Installation."
   4. Recognized industry practices to ensure that products serve intended function.

D. Conduit Joints: Cut square, reamed smooth and drawn up tight.

E. Threaded Conduit Joints: Apply listed anti-corrosion/anti-seize compound to threads of raceway and fittings before making up joint where exposed to wet, damp or outdoor conditions. Follow compound manufacturer's written instructions.

F. Bends:
   1. Number per run for conduit that support feeder and branch circuits: Do not exceed the equivalent of 4 quarter bends (360 degrees) between pull points.
   2. Number per run for conduit that supports data/communications cabling: Do not exceed the equivalent of 2 quarter bends (180 degrees) between pull points.
   3. Make bends and offsets so as not to reduce the inner diameter of the conduit.
   4. To the extent possible, avoid using large junction boxes as 90 degree junctions.

G. Routing:
   1. Concealed Conduits: Run in a direct line with long sweep bends and offsets.
   2. Exposed Conduits: Run parallel to, and at right angles to, building lines.
   3. Secure to boxes and cabinets with locknuts and bushings in such a manner that each system is electrically continuous throughout.

H. Cap conduit ends to prevent entrance of foreign materials during construction.

I. Provide insulated bushings on threaded conduit run terminations.

J. Where entering the bottom of open-bottom equipment (i.e., panelboards and similar equipment) conduit shall not be installed flush with the floor/equipment pad and shall not rise more than 3 inches above the bottom of the enclosure.

K. Conduit entering control panels shall not obstruct internal components and shall allow for neat and workmanlike wire management.

L. Completely install conduit systems before installing conductors.

M. Provide listed sealant in above grade conduit that is exposed to temperature differences to prevent the passage of air and condensation.

N. Support:
   1. Where information on Drawings conflicts with information herein, the more stringent requirements shall take precedence and the better quality or greater quantity of work shall be provided.
   2. Adequately support conduit from structural elements of the building.
   3. Do not drill or tap structural building steel without approval from Engineer.
   4. Do not rest raceways or wiring systems on, nor support it from, ceiling suspension systems, ceiling tiles or mechanical equipment including, but not necessarily limited to ductwork and fans.
   5. Conduit shall be supported in accordance with the NEC and Division 26 Section "Hangers and Supports for Electrical Systems".

O. Provide conduit expansion couplings where conduits cross building or structure expansion joints.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200 pound (90 kg) tensile strength. Label and leave at least 12 inches of slack at each end of pull wire.

Q. SMR Installation:
1. Raceway Systems: Mechanically continuous and connected to boxes in accordance with manufacturer's installation sheets.
2. Steel Raceway: Be electrically continuous and bonded in accordance with the National Electric Code for proper grounding.
3. Raceway Supports: Securely supported at intervals not exceeding 4 feet or in accordance with manufacturer's installation sheets.
4. Raceway Systems Installation: Installed complete, including insulating bushings and inserts where required by manufacturer's installation sheets. Unused raceway openings shall be closed.

R. FMC and LTFMC Installation:
1. Provide separate grounding conductor in accordance with Division 26 Section "Grounding and Bonding."
2. Connection to light fixtures shall not exceed 6 feet in length within an accessible ceiling and 3 feet in length where exposed. Connection to solenoids, pressure switches, motors, fans, HVAC equipment, and similar equipment shall not exceed 3 feet in length.
3. Flexible conduit shall not be used to connect to surface mounted light fixtures or other non-moving, non-vibrating, or non-adjustable equipment.

S. Firestopping: Firestop penetrations of fire rated barriers in accordance with Division 07 Section "Penetration Firestopping".

3.2 CONDUIT SCHEDULE

A. Where information on Drawings conflict with information herein, the more stringent requirements take precedence and the better quality or greater quantity of work shall be provided.

B. Feeders, Branch Circuits and System Conduits:
1. Underground and In or Below Concrete: RMC.
2. Above Slab or Grade:
a. Exposed Conduit Below 10'-0" AFF: RMC where subject to physical damage. EMT where not subject to physical damage.
b. Exposed Conduit Above 10'-0" AFF: EMT.
c. Concealed In Walls: EMT.
d. Concealed Above Ceiling: EMT.

C. Data/communications conduits in dry locations not subject to physical damage and not installed underground nor in or below concrete: EMT, RMC.
1. Data/communication conduits shall be bonded.
2. Data/communication sleeves, provide plastic bushings.
3. Data/communication conduits shall be 3/4-inch minimum.

D. Lighting Fixture Support: RMC.
1. Light fixtures shall not be supported via standard locknuts at the fixture connection. Provide fittings with set-screw or other means to prevent loosening.
2. Hands-free swivel type hangers shall be used in dry locations. Threaded condulet fittings shall be used in Damp and Wet Locations.

E. Connection To Equipment:
1. Lighting Fixtures and Control Devices (including, but not necessarily limited to solenoids, pressure switches, and field instruments):
a. Dry Locations: FMC.
b. Wet or Damp Locations: LTFMC.

F. Provide separate raceway systems for:
   1. Normal power wiring.
   2. Data/communication wiring.
   3. Fire alarm system wiring.
   4. Low voltage signal and control wiring.

G. Do not utilize panelboards or like devices as raceways.

H. For conduits that enter NEMA Type 2, 3, 3R, 4, 4X, and 12 enclosures, provide conduit hubs with o-ring gaskets. Hubs shall be suitable for the environment served and shall match the conduit type. Grounding hubs shall be used with nonmetallic enclosures.

END OF SECTION

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SECTION 26 05 35 – 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 the furnishing and installation of all electrical boxes and the major items listed: Junction boxes.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. NEMA - National Electrical Manufacturer's Association: Standards as applicable to nonmetallic fittings for underground installation.
   2. NECA - National Electrical Contractor's Association's: Applicable portions of "Standard of Installation".

1.4 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed submittals.

B. Regulatory Agencies Requirements:
   1. Provide boxes which are listed and labeled by Underwriters' Laboratories.
   2. NEC - National Electrical Code (NFPA 70) - As applicable to construction and installation of electrical boxes.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer’s directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping.

D. Reject damaged, deteriorated, or contaminated materials and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For Ceilings: 4-inch octagonal boxes for receiving 3 or less 1/2-inch conduits.

B. For Flush Mounting In Walls:
   1. 4-inch square boxes with matching plaster cover for single or 2 gang outlets.
   2. For larger boxes use solid type or special units.
   3. In masonry, use deep boxes.

C. Surface Mounted: 4-inch square.

D. Junction Boxes: Sheet steel junction boxes, with screw-on covers; of the type and shape and size to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers. Dry interior location boxes shall have baked enamel finish. Damp location and exterior boxes shall have galvanized finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install electrical boxes as indicated, in compliance with NEC requirements and in accordance with the Manufacturer's written instructions and recognized industry practices to ensure that the boxes and fittings serve the intended purposes.
2. Provide knockout closures to cap unused knockout holes where blanks have been removed.
3. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
4. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
5. Do not install boxes back-to-back in same wall. Coordinate cutting of masonry walls to achieve neat openings for boxes.
6. Do not use sectional or handy boxes.
7. For boxes mounted in exterior walls install insulation behind boxes to prevent condensation in boxes.
8. Boxes in finished areas shall be located as indicated on the Drawings and so set that the face plates will be flush with the finish on which it is mounted. Where 2 or more devices of any kind are set side by side, set them in gang boxes unless otherwise noted on the Drawings.
9. Locate junction boxes above removable ceilings or in electrical rooms, utility rooms, or storage areas such that boxes will be accessible after completion of building.
10. All boxes shall have covers installed at completion of construction.

END OF SECTION

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 the furnishing and installation of proper identification for electrical system components.

B. Items requiring identification or labeling include:
1. Cables and conductors.
2. Conduit systems.
3. Distribution Equipment: Panelboards, disconnect switches.
4. Fire alarm system equipment.

1.3 SUBMITTALS

A. Nameplate schedule identifying each device to be labeled and project specific label text.

PART 2 - PRODUCTS

2.1 ELECTRICAL LABELS

A. Provide engraved laminated plastic nameplate to identify each piece of electrical equipment:
1. Nameplate shall have 3/8-inch minimum black letters on a white background.
2. Punched or drilled for mechanical fasteners.

B. Provide printed labels by Brady or T&B to identify conductors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Attach nameplates directly to each piece of electrical equipment. In finished areas of building, install nameplates behind enclosure door where possible.
2. Where several conductors pass through a junction box or enclosure, provide wire labels. Group wires before labeling.

B. Cables and Conductors: In accordance with Division 26 Section “Conductors and Cables – 600V and Below.”

C. Conduit Systems:
1. Junction boxes used for fire alarm system wiring shall be red.
2. Provide label inside each junction box identifying circuit numbers for all conductors contained inside the box. Labeling shall be printed neatly with permanent, waterproof, black ink marker.

D. Distribution Equipment: For each of the following pieces of distribution equipment, provide label attached to enclosure cover. Label shall identify:
   1. Panelboards:
      a. Equip interior of enclosure door with an updated circuit directory frame, typewritten card, and clear plastic cover for each panelboard impacted by this project. Directory shall identify load description for each circuit, including spares. Hand lettering is not acceptable.

E. Fire Alarm System Equipment: Provide label attached to enclosure cover. Label shall identify name of device as indicated on fire alarm system riser diagram or electrical drawings (example, “FIRE ALARM CONTROL PANEL”).

END OF SECTION

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 the furnishing and installation of all wiring devices and the major items listed below:
   1. Switches.
   2. Wall plates.
   3. Wall box dimmers.
   4. Box covers.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. NEMA - National Electrical Manufacturer's Association - Standards for general and specific purpose wiring devices WD-1, WD-s.
   2. Federal Specifications WC-596 and WS-896.
   3. Underwriter Laboratories (UL) Standard 498.

1.4 SUBMITTALS

A. Shop Drawings: For wiring devices.
   1. Name of Manufacturer.
   2. Model number.
   3. Details of construction and installation
   4. Electrical specifications and ratings.
   5. Dimensional data.
   6. Color and finish.

1.5 QUALITY ASSURANCE

A. Regulatory Agencies Requirements:
   1. NEC - National Electrical Code (NFPA 70) as applicable to construction and installation of electrical wiring devices.
   2. UL Labels. Provide wiring devices which have been tested and are listed and labeled by Underwriters' Laboratories.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping.

D. Reject damaged, deteriorated, or contaminated materials and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 WIRING DEVICES

A. General:
1. Provide factory-fabricated wiring devices in type, color, and electrical rating as indicated below.
2. Where type and grade are not indicated, proper selection shall be determined by installer to fulfill the wiring requirements and to comply with NEC and NEMA standards for wiring devices.

B. Manufacturers: Provide equal products by one of the following Manufacturers for switches and receptacles specified:
1. Arrow Hart - Cooper Wiring Devices.
2. Leviton.
3. Hubbell Wiring Systems.
4. Pass and Seymour – Legrand.

C. Switches:
1. Switch Rating: 20 amp, 1201277V, specification grade, quiet operating.
2. Switch Provisions: Back and side wiring.
3. Device Color: Ivory.
4. Manufacturer: Hubbell.

D. Wall Box Dimmers:
1. Rating: 600 W minimum, larger as required to control load indicated on Drawings.
2. Type: Linear slide type.
3. Provisions: Gangable with single common cover plate.
4. Device Color: Ivory.
5. Manufacturer: Hubbell.

E. Wall Plates:
1. Number: Provide a single switch wall plate for wiring devices grouped at each location.
2. Attachment: Provide metal screws for securing plates to devices, screw heads colored to match finish of plate.
3. Construction:
   a. Stainless Steel: 0.04-inch thick, Type 302 satin finished stainless steel, accurately die cut, protected with release paper.
   b. Plastic: Phenolic or urea standard grade, color to match device.
   c. When surface mounted device boxes are utilized, the plate shall match the box (i.e., a 4 square box shall require a raised device cover, an FS or FD box shall require an FS or FD device cover, and a PVC coated box shall require a PVC coated cover, etc.)
   d. Flush Mounting Devices: Beveled type with smooth edge:
      1) Finished Areas: Plastic.
      2) Unfinished Areas: Plastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install wiring devices in accordance with:
   a. The Drawings.
   b. Manufacturer's written instructions.
   c. Applicable requirements of NEC and National Electrical Contractors Association's "Standard of Installation".
   d. Recognized industry practices to ensure that products serve intended function.
2. Delay installation of devices until wiring is completed.
3. Install receptacles and switches only in electrical boxes which are clean and free from excess building materials and debris.

B. Switches:
   1. Install as indicated on the Drawings to control lights as indicated.
   2. Where more than 1 wall switch is installed in same location, set under 1 cover plate.

C. Wall Box Dimmers:
   1. Gang together multiple dimmer switches located at one location.
   2. Derate ganged dimmers in accordance with Manufacturer's instructions.
   3. Do not operate on common neutral circuits.

D. Wall Plates:
   1. Install coverplates on all wiring devices
   2. Plate shall cover entire wall opening.

3.2 FIELD QUALITY CONTROL

A. Testing: Test wiring devices to ensure electrical continuity of grounding connections, and test after energizing circuitry, to demonstrate compliance with requirements.

END OF SECTION

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SECTION 26 50 00 – 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 the furnishing and installation of all lighting and the major items listed below:
   1. Interior luminaires.
   2. Exterior luminaires.
   3. Drivers.
   4. LEDs installed in luminaires.
   5. Luminaire supporting systems.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ANSI-UL Standards:
      a. 924 - Emergency Lighting and Power Equipment.
      b. 1449, Surge Protective Devices.
      c. 1598 – Luminaires.
      d. 8750 – Light Emitting Diode (LED) Equipment for Use in Lighting Products.
   2. NFPA:
      a. 70 – National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
      b. 101 – Life Safety Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction.
   3. FCC Rules.
   4. AASHTO (American Association of State Highway and Transportation Officials):
      a. LTS-4 – Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
   5. Illuminating Engineering Society of North America (IES):
      a. LM-79 – Electrical and Photometric Measurements of Solid-State Lighting Products.
      b. LM-80 – Measuring Lumen Maintenance of LED Light Sources.
      c. TM-15 – Luminaire Classification System for Outdoor Luminaires.
      d. TM-21 – Projecting Long Term Lumen Maintenance of LED Light Sources.
   6. LED Lighting Facts:
      a. Submission Requirements:
         1) (http://www.lightingfacts.com/About/Content/Manufacturers/SubmissionRequirements).
   7. Energy Star:
      a. Energy Star TM-21 Calculator, rev. 08.28.14 or latest (www.energystar.gov/TM-21Calculator).

1.4 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI Color Rendering Index.

C. Fixture: See “Luminaire.”

D. IP: International Protection or Ingress Protection Rating

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

H. Useful Life (For LED Luminaire Light Source) - The operating hours before reaching 70% of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions. This is also known as 70% "Rated Lumen Maintenance Life" as defined in IES TM-80.

1.5 SUBMITTALS

A. Shop Drawings:
   1. For luminaries, submit the following:
      a. Luminaire designation.
      b. Name of Manufacturer.
      c. Model number.
      d. Details of construction and installation.
      e. Dimensions and rough-in requirements.
      f. Voltage.
      g. Photometric data and adjustment factors based on laboratory tests.
      h. Driver Data:
         1) Name of Manufacturer.
         2) Model number.
         3) Operating characteristics.
      i. Wiring diagrams.
      j. Color and finish.
      k. Options and accessories.
   2. For Exterior LED Luminaires, submit the following:
      a. LED Luminaire – IES LM-79 Test Report.
      b. LED Luminaire – IES LM-80 Test Report.
      c. Provide long term lumen maintenance projections for each LED luminaire in accordance with IES TM-21. Data used for projections shall be obtained from testing in accordance with IES LM-80.
   3. For Interior LED Luminaires, submit the following:
      a. Life, output (lumens, CCT, and CRI), and energy efficiency data.
      b. LED Luminaire – IES LM-79 Test Report.
      c. LED Luminaire – IES LM-80 Test Report.
      d. Provide long term lumen maintenance projections for each LED luminaire in accordance with IES TM-21. Data used for projections shall be obtained from testing in accordance with IES LM-80. According to IES TM-21, "Reported" values are restricted to 5.5x or 6x (depending on sample size) the duration of IES LM-80 testing, whereas "Calculated" (i.e., projected) values are unrestricted. Manufacturer shall indicate whether TM-21 data is "Reported" or "Calculated".

B. Certificates:
   1. Luminaire Useful Life Certificate: Submit certification from the manufacturer indicating the expected useful life of the luminaires provided. The useful life shall be directly correlated from the IES TM-80 test data using procedures outlined in IES TM-21. Thermal properties of the specific luminaire and local ambient operating temperature and conditions shall be taken into consideration.

C. Operation and Maintenance Manuals: For Luminaires.
   1. Equipment function, normal operating characteristics, and limiting conditions.
   2. Assembly, installation, alignment, adjustment, and checking instructions.
   3. Operating instructions for start-up, routine and normal operating, regulation and control, shutdown, and emergency conditions.
   4. Maintenance instructions.
   5. Guide to "troubleshooting."
   6. Parts list and predicted life of parts subject to wear.
   7. Project specific outline and cross sections, assembly drawings, engineering data, and wiring diagrams.
   8. Test and performance curves.

D. Record Drawings: Submit 2 copies to Owner identifying maintenance and lamp replacement requirements.

1.6 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed submittals.

B. All equipment shall be UL listed.

1.7 WARRANTY

A. In accordance with the warranty provisions defined in the General Conditions and Supplementary Conditions:
   1. LED Luminaires:
      a. Provide 5 year manufacturer warranty for all LED luminaires, including drivers, luminaire housing, wiring, and connections.
      b. Loss of 10% or more of light output from the LED sources in an LED luminaire during the warranty period constitutes luminaire failure.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping.

D. Reject damaged, deteriorated, or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in Luminaire Schedule on the Drawings.

B. Substitutions: In accordance with Division 01 Section "Product Substitution Procedures."

2.2 MATERIALS

A. General:
   1. Furnish luminaires with all trims and accessories required for the various types of ceiling and wall construction.
   2. Provide "damp" or "wet" location labels on all luminaires installed outdoors and in damp or wet interior locations.
   3. All recessed luminaires shall be thermally protected.
   4. Provide low temperature drivers for all luminaires installed outdoors or in unheated interior spaces.
   5. Exterior LED luminaires shall be rated for operation within an ambient temperature range of -40-degrees C to 40-degrees C.
   6. Interior LED luminaires shall be rated for operation at an average ambient temperature of 25 degrees C.

B. Lamps: As indicated on Drawings and as listed in the Luminaire Schedule.

C. LED Luminaires:
   1. Correlated Color Temperature (CCT) shall be in accordance with NEMA ANSI ANSLG C78.377 – Specifications for the Chromaticity of Solid State Lighting Products.
   2. LED Power Supply Units (Drivers): Minimum efficiency shall be 85%.
   3. Exterior LED Luminaires shall meet the performance requirements specified in ANSI C136.2 for electrical immunity, using the enhanced combination wave form test level (10kV/5kA).
   4. Provide 0 to 10V dimming driver as indicated on the Luminaire Schedule. Dimming range shall be 100% to 1% of rated lamp lumens, unless otherwise noted on the Luminaire Schedule.
      a. Shall be rated to operate between ambient temperatures of -22 degrees F and 104 degrees F.
      b. Shall be designed to operate on the voltage system to which they are connected.
      c. Operating frequency shall be 60 Hz.
      d. Power factor (PF) shall be greater than or equal to 0.90.
      e. Shall be RoHS-compliant.
      f. Shall be mounted integral to luminaire. Unless indicated otherwise, remote mounting of power supply is not allowed.
   5. LED Luminaire Surge Protection: Provide surge protection integral to luminaire to meet C Low waveforms as defined by IEEE C62.41.2, Scenario 1, Location Category C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that outlet boxes are installed in proper locations at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

B. Verify that suitable support frames are installed where required.

C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

D. Verify that conditions are satisfactory for installation prior to starting Work.

3.2 PREPARATION

A. Examine all pertinent details (architectural and otherwise) in the Contract Documents that are relevant to the installation of luminaires.

B. Provide extension rings to bring outlet boxes flush with finished surfaces.

C. Remove all dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. General:
   1. Install surface mounted, recessed, or semi-recessed luminaires to maintain the alignment, spacing, layout, and general arrangement indicated on the Drawings.
   2. Obtain approval of Engineer for all proposed changes that may be required due to field conditions and/or to avoid conflicts with Work by other trades.
   3. Install all luminaires in accordance with Manufacturer's recommendations.
   4. Equip all luminaires with the specified functional lamps prior to Substantial Completion.
   5. In the installation of exterior luminaires, take care to maintain symmetry with existing installation, while conforming to the Drawings.

B. Coordination:
   1. Coordinate locations of recessed and surface mounted luminaires in ceiling systems with Division 09.
   2. Locate luminaires according to the reflected ceiling Drawings, if furnished.
   3. Coordinate location of luminaires in Mechanical HVAC and Plumbing areas with other trades.
   4. Notify Engineer of field conditions that contradict Drawings or Specifications prior to beginning work.
   5. Coordinate space conditions that contradict or conflict with Work by other trades before installing luminaires.

C. Mounting and Support:
   1. Recessed Luminaires:
      a. Wire luminaires that are mounted in or on the underside of lay-in ceilings with flexible conduit to an outlet box on the rigid conduit system above, such that the rigid conduit system does not interfere with the removal of lay-in ceiling panels or luminaires.
      b. Do not support luminaires directly on ceiling panels.
      c. Install a minimum of four ceiling support system rods or wires for each luminaire. Locate rods or wires not more than 6-inches from the corners of each luminaire
      d. Support Clips: Fasten to each luminaire and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.
      e. Securely mount luminaires and electrical boxes to elements of the building structure such that luminaires will be square, plumb, and rigid; and will not fall or sag, and will not cause the suspended ceiling system to fall or sag.
      f. Install at least one independent support rod or wire from structure to a tab on each luminaire. Wire or rod shall have a breaking strength equal to the weight of luminaire plus a safety factor of 3.
      g. Provide all additional means (metal plates, etc.) necessary to support luminaires that would put excessive stress on the ceiling system.
   2. Surface Mounted Luminaires:
      a. Securely mount luminaires and electrical boxes to elements of the building structure such that luminaires will be square, plumb, and rigid; and will not fall or sag, and will not cause the ceiling system to fall or sag.
      b. Provide all additional means (metal plates, plywood backing, expansion bolts, toggle bolts, etc.) necessary to support luminaires that would put excessive stress on the ceiling system.

3.4 FIELD QUALITY CONTROL

A. Test all luminaires and lighting controls for proper operation.

B. All luminaires shall operate properly.

C. Adjusting and Aiming:
   1. All final adjusting and aiming of luminaires (such as focusing all adjustable luminaires) shall be done during the night hours. Contractor shall prearrange time with Engineer so Engineer can be present. Final adjustments shall be made as directed in field by Engineer.
   2. Replace all defective luminaires immediately prior to Substantial Completion.

3.5 CLEANING

A. Clean all luminaire trims, exposed housings, doors, lenses, and reflectors immediately prior to Substantial Completion.

END OF SECTION

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SECTION 28 31 00 – FIRE DETECTION AND ALARM

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 furnishing and installation of an extension and upgrade to the existing building fire detection and alarm system. All existing fire alarm systems capabilities shall be maintained, except as noted in this Section.

B. Existing Fire Alarm System: Edwards EST3 Emergency Communications Platform (FACP).

C. Division of Work:
   1. In accordance with the General Conditions, Contractor is responsible for dividing the Work among the Subcontractors and Suppliers and for delineating the work to be performed by specific trades. The following are suggestions as to how the Work may be divided. This is not a complete list of all the work:
      a. Electrical Subcontractor:
         1) Coordinate equipment.
         2) Install and wire all system components.
      b. Fire Alarm System Supplier: Test completed system.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of the Section shall comply with the following:
   1. NFPA Standards:
      a. NFPA 70 - National Electric Code.
      b. NFPA 72 - National Fire Alarm Code.
      c. NFPA 90A - Air Conditioning Systems.
      d. NFPA 92A - Smoke Control Systems.
      e. NFPA 92B - Smoke Management Systems in Malls, Atria, and Large Areas.
      f. NFPA 101- Life Safety Code.
      g. NFPA 13 - Installation of Sprinkler Systems.
      h. NFPA 17 - Dry Chemical Extinguishing Systems.
   2. UL Standards
      a. UL 864 - Control Units for Fire Protective Signaling Systems.
      b. UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
      c. UL 268A - Smoke Detectors for Duct Applications.
      d. UL 521 - Heat Detectors for Fire Protective Signaling Systems.
      e. UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
      f. UL 464 - Audible Signaling Appliances.
      g. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
      h. UL 1971 - Signaling Devices for the Hearing-Impaired.
      i. UL 1481 - Power Supplies for Fire Protective Signaling Systems.
      j. UL 1635 - Digital Alarm Communicator System Units.
   3. State Office of Fire Safety – State of Ohio.
   4. Federal Codes and Regulations.
   5. Americans with Disabilities Act (ADA).
   6. International Standards Organization (ISO):
      a. ISO-9000.
      b. ISO-9001.

1.4 SYSTEM DESCRIPTION

A. Provide and install an extension and upgrade to the existing fire alarm system devices as indicated on Drawings and this specification. Fire alarm system shall also be capable of functioning as an Emergency Communication System (ECS).

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

A. Maintain existing building performance. System shall be programmed to provide early detection of fire, to notify building occupants, summon local fire department, override HVAC operation, transmit alarm to University Campus Security, and activate auxiliary systems to inhibit the spread of smoke and fire and to facilitate the safe evacuation of building occupants.

1.6 GENERAL

A. Maintain all existing functions of the existing fire alarm system with the exception of the following.
   1. Activation of one smoke detector within a dorm suite shall alarm locally within the dorm suite and display alarm at building fire alarm control panel, Activation of a second smoke detector at any location within the dorm suite shall display alarm at building fire alarm control panel (FACP), graphically display alarm at University Campus Security, summon local fire department, activate visual strobes and audible appliances throughout the building and all suites, and recall elevator to the primary floor.

1.7 SUBMITTALS

A. Shop Drawings: For all system components.
   1. Data sheet indicating model number, performance specifications and dimensional data, color and finish.
   2. Details of construction and installation.
   3. Name of manufacturer.
   4. Full system schematic.
   5. Wiring details.
   6. Point-to-point wiring diagram showing all equipment.
   7. Battery calculations.
   8. Floor plan indicating fire alarm system devices only.
   9. Dimension plan indicating all items located inside fire alarm control panel. Plan should indicate future space.
   10. Indicate all features indicated in this specification which are not included in the manufacturer's equipment. Label these items as "Exceptions to the Specifications".

B. Layout drawings (plans) identifying all fire detection and alarm system devices. Plans shall be to scale and indicate mounting height for each device.

1.8 EMERGENCY COMMUNICATION SYSTEM

A. The existing Fire Alarm system shall be verified or altered so that the Emergency Communication System (ECS) provides manual control with the capability of making live voice announcements. ECS must also be furnished to provide occupants notification on either a selective or all-call basis.

1.9 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed submittals.
   3. NICET Level 2 certified.

B. Manufacturer:
   1. At least 5 years experience with approved systems.
   2. Having authorized service facility within 100 miles of Site.

C. Components: All components shall be UL listed for intended use.

D. Manufacturer's Services:
   1. Manufacturer's Certificate:
      a. Submit for installed system.
      b. Required Assurances:
         1) Confirmation of final inspection.
         2) Installation conforms to Specifications and Manufacturer's requirements.
   2. Provide Owner training program.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping.

D. Reject damaged, deteriorated, or contaminated materials and immediately remove from the Site. Replace rejected material with new materials at no additional cost to Owner.

1.11 WARRANTY

A. The Contractor shall warranty all materials, installation and workmanship for 1 year from date of acceptance, unless otherwise specified, except where system components are existing to remain.

B. A copy of the Manufacturer's warranty shall be provided with close-out documentation and included with the operation and installation manuals.

C. The System Supplier shall maintain a service organization with adequate spare parts stock within 75 miles of the installation.

D. Any defects that render the system inoperative shall be repaired within 24 hours of the owner notifying the contractor.

1.12 CLOSE OUT

A. Close out submittals shall include:
   1. Project specific operating manuals covering the installed fire detection and alarm system.
   2. Manufacturer's data sheets and installation manuals/instructions for all equipment supplied.
   3. Owner’s instruction and operation manual.
   4. Record drawings consisting of: a scaled plan of each building showing the placement of each individual item of the fire detection and alarm system as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
   5. All drawings must reflect point to point wiring.
   6. All drawings shall be provided in standard .DXF format. A vellum plot of each sheet shall also be provided.
   7. The application program listing for the system as installed at the time of acceptance by the building owner and/or local AHJ (disk, hard copy printout, and all required passwords).
   8. Provide the name, address, and telephone of the authorized factory representative.
   9. A filled out Record of Completion similar to NFPA 72, 1999 edition figure 1-6.2.1.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Match existing Manufacturer (Edwards).

2.2 CONTROL PANEL (EXISTING)

A. The existing control panel is an Edwards EST3 panel.

B. The control panel shall include all required hardware, software and site specific system programming to provide a complete and operational system.

C. The control panel shall include the following circuits:
   1. Class B initiating device circuits.
   2. Class B signaling line circuits.
   3. Class B notification appliance circuits.

D. The control panel(s) operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

E. Provide system reports that provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.

F. The control panel shall contain a standby power supply that automatically supplies electrical energy to the system upon primary power supply failure. The system shall include a charging circuit to automatically maintain the electrical charge of the battery.

G. Annunciation:
   1. The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the building.
   2. Standard LED annunciators may be combined in common enclosures provided that the groups of LED's comprising each of the required annunciators are separated from one another (Detection, Supervisory, Status, and Status) and clearly labeled.
   3. Manufacturers' standard control switches shall be acceptable if they provide the required operation, including performance, supervision, and position indication. If the manufacturers' standard switches do not comply with these requirements, fabrication of custom manual controls acceptable to the Owner is required.
   4. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet.

H. Off Premise Communication:
   1. Maintain existing off premise communications.

I. Power Supply:
   1. Maintain existing power supply(s). Provide new as required.
   2. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any system functions.
   3. Each system power supply shall be individually supervised. Power supply trouble signals shall identify the specific supply and the nature of the trouble condition.
   4. All standby batteries shall be continuously monitored by the power supply. Low battery and disconnection of battery power supply conditions shall immediately annunciated as battery trouble and identify the specific power supply affected.
   5. All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.

6. All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of NFPA 72. The AC power circuit shall be installed in conduit raceway. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside each control panel the disconnect serves.

J. Reports:
1. Maintain existing reports and update for new devices.
2. The system shall provide the operator with system reports that give detailed description of the status of system parameters for corrective action, or for preventative maintenance programs.
3. The system shall provide these reports via the main LCD, and shall be capable of being printed on any system printer.
4. The system shall provide a listing of all of the firmware revision listings for all of the installed network components in the system.

2.3 INITIATING DEVICES

A. Match existing FACP manufacturer.

B. Analog Addressable Smoke Detectors – General:
1. Each Analog addressable smoke detector's sensitivity shall be capable of being programmed individually as most sensitive, more sensitive, normal, less sensitive, or least sensitive.
2. In addition to the five sensitivity levels the detector shall provide a prealarm sensitivity setting, which shall be settable in 5% increments of the detector's alarm sensitivity value.
3. The detector shall provide a maintenance alert signal that 75% to 99% compensation has been used.
4. The detector shall provide a dirty fault signal that 100% greater compensation has been used.
5. The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system.

C. Smoke Detectors:
1. Smoke detectors shall be photoelectric type, with visible LED alarm light and 520Hz sounder base.
2. Separate mounting base and detachable sensor head.

D. Detector Bases: Provide standard detector mounting bases suitable for mounted on 1-gang, 3-1/2-inch or 4-inch octagon box, and 4-inch square box.

E. Addressable Relays/Monitor And Control Modules: Form C normally open/normally closed dry relay contacts rated at 24VDC at 2 amps.

F. Manual Pull Stations:
1. Shall be analog/addressable, double action, single stage, recessed pull-lever, open circuit type. Finish of the station to be red with lettered instructions "PULL IN CASE OF FIRE."

2.4 NOTIFICATION APPLIANCES

A. Low Profile Speaker Strobes/Low Profile Strobes:
1. Provide wall mounted speaker/strobe with audible output of up to 96 dBA from 10 feet.
2. Speakers shall be wired separately from strobes.
3. Strobes shall provide synchronized flash outputs.
4. Wall mounted strobe Candela ratings of 15cd, 30cd, 60cd, 75cd, 110cd. Candela ratings shall be determined by equipment supplier.
5. Ceiling mounted strobe Candela ratings of 15cd, 30cd, 75cd, 90cd, 115cd, 150cd, and 177cd Candela ratings shall be determined by equipment supplier.
6. Include in cost up to ten additional notification appliances of any type to be installed at any location within the building.

PART 3 - EXECUTION

3.1 WIRING

A. All wiring shall be in accordance with Manufacturer's written recommendations and shall meet all applicable code requirements.

B. All wiring shall be copper.

C. No. 16 AWG minimum for signaling line circuits (SLCs)

D. No. 14 AWG THHN minimum for audible and visual notification appliance circuits (NACs).

E. No. 12 AWG THHN minimum for line voltage.

F. Install wiring completely in metal raceways in accordance with Division 26 "Raceways for Electrical Systems."

G. Cable type shall be FPLP, FPLR, and XHHW-2.

H. Compression couplings are required for all fire alarm conduits.

I. All wires shall be terminated with ring or split terminal crimp on connectors.

J. Splicing of power and or/or control wiring and the use of wire nuts is prohibited.

K. Wiring within enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams.

3.2 EQUIPMENT INSTALLATION

A. Manual Pull Stations: Unless otherwise indicated, mount semi-flush in recessed back boxes.

B. Smoke Detectors: Install detectors indicated to be ceiling mounted not less than 4 inches from a side wall to the near edge. Install detectors located on the wall at least 4 inches but not more than 12 inches below the ceiling. For exposed solid joist construction, mount detectors on the bottom of the joists. On smooth ceilings, install detectors not over 30 feet apart in any direction. Install detectors no closer than 5 feet from air registers.

C. Audio/Visual Alarm Indicating Devices: Mount at 80 inches above the highest floor level within space or 12 inches below the ceiling, whichever is lower. Unless otherwise indicated, install speakers on flush- mounted back boxes with the device operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

3.3 GROUNDING

A. Ground equipment and conductor and cable shields. For audio circuits, minimize to the greatest extent possible ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5 ohm ground at main equipment location. Measure, record, and report ground resistance.

3.4 FIELD QUALITY CONTROL

A. All intelligent analog addressable devices shall be tested for current address, sensitivity, and user defined message.

B. All wiring shall be tested for continuity, shorts, and grounds before the system is activated.

C. All test equipment, instruments, tools, and labor required to conduct the tests shall be made available by the installing contractor.

D. The system including all its sequence of operations shall be demonstrated to the Owner, his representative, and the local fire inspector. In the event the system does not operate properly, the test shall be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to the Owner, his representatives and the fire inspector.

E. At the final test and inspection, a factory trained representative of the system manufacturer shall demonstrate that the system functions properly in accordance with these specifications. The representative shall provide technical supervision, and participate during all of the testing for the system.

F. All fire alarm testing shall be in accordance with National Fire Alarm Code, NFPA 72 - 1999, Chapter 7.

G. A letter from the Contractor certifying that the system is installed entirely in accordance with the system manufacturer's recommendations and within the limitations of the required listings and approvals, that all system hardware and software has been visually inspected and functionally tested by a manufacturer's certified representative, and that the system is in proper working order.

H. Cabling for the floor’s fire alarm system devices: The cable shall not penetrate floors or ceilings (i.e. cable may only be used on a single floor).

I. All wires shall be terminated with ring or split terminal crimp-on connectors.

J. Splicing of power and/or control wiring and the use of wire nuts is prohibited.

K. Wiring within enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams.

L. Multiconductor Non-Power-Limited Fire Alarm Cables are permitted to be installed as wiring within buildings for the following locations:
   1. Space used for Environmental air-handling purposes.
   2. In exposed or fished in concealed spaces.
   3. Where passing through a floor or wall in metal raceway.

END OF SECTION

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