



ELITE HALL ADDITION

Hyrum, Utah

Technical Specifications

Bid/Permit Set
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Prepared By



Case, Lowe & Hart, Inc.

CLH Project #25390

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**SECTION 012000
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SCHEDULE OF VALUES

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

1.02 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Execute certification by signature of authorized officer.
- D. Submit one electronic and three hard-copies of each Application for Payment.

1.03 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

1.04 APPLICATION FOR FINAL PAYMENT

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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**SECTION 012500
SUBSTITUTION PROCEDURES**

PART 1 GENERAL

1.01 DEFINITIONS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
- D. Limit each request to a single proposed substitution item.

3.02 RESOLUTION

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

3.03 ACCEPTANCE

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

3.04 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.

END OF SECTION

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**SECTION 013216
CONSTRUCTION PROGRESS SCHEDULE**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- B. Submit updated schedule with each Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

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

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Provide legend for symbols and abbreviations used.

3.03 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.

END OF SECTION

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**SECTION 014533
CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Code or Building Code: ICC (IBC), International Building Code, most recent edition adopted by authority having jurisdiction, including all applicable amendments and supplements without limitation, and specifically Chapter 17 - Special Inspections and Tests.
- B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.
- C. NIST: National Institute of Standards and Technology.
- D. Special Inspections and Tests: Inspections and testing of materials, installation, fabrication, erection, or placement of components and connections mandated by Building Code to safeguard public welfare.
 - 1. Special inspections and tests are separate from and independent of tests and inspections conducted by Owner or Contractor for purposes of quality assurance and contract administration.

1.02 SUBMITTALS

- A. Special Inspection Agency Qualifications: Prior to start of work, Special Inspection Agency is required to:
 - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.
 - 4. Submit documentation that Special Inspection Agency is accredited by IAS according to IAS AC291.
- B. Testing Agency Qualifications: Prior to start of work, Testing Agency is required to:
 - 1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Submit certification that Testing Agency is acceptable to AHJ.
- C. Manufacturer's Qualification Statement: When required by AHJ, submit documentation of manufacturing capability and quality control procedures. Include documentation of AHJ approval.
- D. Special Inspection Reports: After each special inspection, Special Inspector is required to submit at least two copies of report; one to Architect and one to AHJ.

1.03 QUALITY ASSURANCE

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SPECIAL INSPECTIONS AND TESTING

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

END OF SECTION

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**SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 GENERAL

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.02 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.03 PROGRESS CLEANING

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

3.04 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.05 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.

- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

3.06 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- C. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- D. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- E. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION

**SECTION 017800
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

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

3.02 OPERATION AND MAINTENANCE DATA

- A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

3.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

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

3.04 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

3.05 WARRANTIES AND BONDS

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

END OF SECTION

**SECTION 024100
DEMOLITION**

PART 3 EXECUTION

1.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 3. Provide, erect, and maintain temporary barriers and security devices.

1.02 DEBRIS AND WASTE REMOVAL

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

END OF SECTION

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**SECTION 033000
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- B. Test Reports: Submit report for each test or series of tests specified.
- C. Test Reports: Submit termite-resistant sheet manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.
- D. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

1.02 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 2. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Plain billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
- B. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
- C. Fly Ash: ASTM C618, Class F.
- D. Calcined Pozzolan: ASTM C618, Class N.
- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI PRC-211.1.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:

1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.

2.06 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- C. Normal Weight Concrete:
 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch.
 2. Fly Ash Content: Maximum 15 to 20 percent of cementitious materials by weight.
 3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
 4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
 5. Water-Cement Ratio: Maximum 40 percent by weight.
 6. Total Air Content: 4 to 6 percent, determined in accordance with ASTM C173/C173M.
 7. Maximum Slump: 3-4 inches.
 8. Maximum Aggregate Size: 5/8 to 1 1/2 inch.

PART 3 EXECUTION

3.01 PREPARATION

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.

3.02 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

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

3.03 PLACING CONCRETE

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

3.04 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
 2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
 3. Under Carpeting: 1/4 inch in 10 feet.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.05 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.

3.06 CURING AND PROTECTION

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

END OF SECTION

**SECTION 042613
MASONRY VENEER**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.
- B. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar and accessories and structural backup in mock-up.

1.02 FIELD CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
 - 1. Color and Texture: Match existing.
 - 2. Nominal Size: As indicated on drawings.
 - 3. Compressive Strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.

2.02 MORTAR MATERIALS

- A. Masonry Cement: ASTM C91/C91M Type N.
 - 1. Colored Mortar: Premixed cement as required to match Architect's color sample.
- B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Grout Aggregate: ASTM C404.
- E. Water: Clean and potable.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Joint Reinforcement Standard: ASTM A951/A951M.
 - 1. Type: Truss or ladder.
- B. Strap Anchors: Bent steel shapes, 1-1/2-inch width, 0.105-inch thickness, 24-inch length; with 1-1/2 inches long, 90-degree bend at each end to form U or Z shape or with cross pins; hot-dip galvanized in accordance with ASTM A153/A153M Class B.

2.04 FLASHINGS

- A. Metal Flashing Materials:
 - 1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.
- B. Drip Edge: Stainless steel; compatible with membrane and adhesives.
- C. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.05 ACCESSORIES

- A. Weeps:
 - 1. Type: Preformed aluminum vents with sloping louvers.
- B. Cavity Vents:
 - 1. Type: Polyester mesh.
- C. Drainage Fabric: Polyester mesh bonded to a water and vapor-permeable fabric.

- D. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

2.06 MORTAR MIXING

- A. Mortar for Unit Masonry: ASTM C270, Proportion Specification.
 - 1. Exterior, non-loadbearing masonry; Type N.

PART 3 EXECUTION

3.01 COURSING

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

3.02 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.
- B. Install cavity vents in veneer walls at 32 inches on center horizontally below shelf angles and lintels and at top of walls.

3.03 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.04 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing:
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

END OF SECTION

**SECTION 055213
PIPE AND TUBE RAILINGS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
- B. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.
- C. Fabricator's Qualification Statement.

1.02 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Comply with ASTM E985.
- C. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- E. Allow for expansion and contraction of members and building movement without damage to connections or members.
- F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- C. Exposed Fasteners: No exposed bolts or screws.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.

PART 3 EXECUTION

3.01 INSTALLATION

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

- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

END OF SECTION

**SECTION 061000
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.
- B. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

1.02 WARRANTY

- A. Manufacturer Warranty: Provide 2-year manufacturer warranty for materials and workmanship commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

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

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Western Wood Products Association; WWPA G-5.
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 by 2 through 2 by 6):
 - 1. Species: Douglas Fir-Larch.
 - 2. Grade: No. 2.

2.03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Gypsum Board Screws: ASTM C1002; Type W, bugle head, self-piercing, tapping screws; length to penetrate wood members 5/8 inch minimum.
- B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
 - 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- C. Liquid Flashing: One-part, fast-curing, nonsag, elastomeric, gun grade, trowelable liquid flashing.

2.04 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWP standards.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Install structural members full length without splices unless otherwise specifically detailed.
- C. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
- D. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

3.03 FIELD QUALITY CONTROL

END OF SECTION

**SECTION 061500
WOOD DECKING**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Indicate deck framing system, loads and cambers, bearing details, and framed openings.

1.02 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 WOOD MATERIALS

- A. Timber Tongue and Groove Roof Decking: Comply with AWC WCD2 .
- B. Plywood Decking: PS 1 veneer plywood; APA Rated Sheathing, Span Rating ____; Exterior grade; 1 A interior veneer appearance grade; sanded.
- C. Structural Glued Laminated Timber Decking: Softwood lumber of any species fabricated to comply with ANSI A190.1 and AITC 113, laminated with adhesive tested according to ASTM D2559 for wet service; beveled edges, single tongue.
 - 1. Appearance: Fabricate to AITC 110 framing grade.
 - 2. After end trimming, seal with penetrating sealer.

2.02 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fastener Type and Finish: Hot-dipped galvanized steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.03 WOOD TREATMENT

- A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 INSTALLATION - DECK BOARD CLIPS

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

3.02 INSTALLATION - BOARD DECKING

- A. Install decking perpendicular to framing members, with ends staggered over firm bearing. On sloped surfaces, lay decking with tongue upward.

END OF SECTION

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**SECTION 061733
WOOD I-JOISTS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Wood I-Joists: Solid lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.
 - 1. Span Rating: Established and monitored in accordance with ASTM D5055 by independent inspection agency.
 - 2. Oriented Strand Board: Comply with PS 2.
 - 3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
 - 4. Depth: As indicated on drawings.
- B. Wood-Based Components:
 - 1. Wood fabricated from old growth timber is not permitted.

2.02 WOOD TREATMENT

- A. Factory-Treated Lumber and Plywood: Comply with requirements of AWWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 ERECTION

- A. Set structural members level and plumb, in correct position.
- B. Do not field cut or alter structural members without approval of Architect.

END OF SECTION

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**SECTION 061800
GLUED-LAMINATED CONSTRUCTION**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, framed openings .

PART 2 PRODUCTS

2.01 MATERIALS

- A. Lumber: Softwood lumber complying with RIS (GR) grading rules with 12 percent maximum moisture content before fabrication. Design for the following values:
 - 1. Bending (Fb): 2,400 psi.
 - 2. Tension Parallel to Grain (Ft): 1100 psi.
 - 3. Compression Parallel to Grain (Fc): 1,650 psi.
 - 4. Compression Perpendicular to Grain Bottom (Fc1): 650 psi.
 - 5. Compression Perpendicular to Grain Top (Fc1): 650 psi.
 - 6. Horizontal Shear (Fv): 265 psi.
 - 7. Modulus of Elasticity (E): 1,800,000 psi.
- B. Steel Connections and Brackets: ASTM A36/A36M weldable quality, galvanize per ASTM A123/A123M.
- C. Anchor Bolts: ASTM F3125/F3125M, Type 1 heavy hex high strength bolts and ASTM A563 (ASTM A563M) nuts; hot-dip galvanized to meet requirements of ASTM A153/A153M, matching washers.
- D. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.

2.02 WOOD TREATMENT

- A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

2.03 FABRICATION

- A. Fabricate glue laminated structural members in accordance with AITC Industrial grade.
- B. Cut and fit members accurately to length to achieve tight joint fit.
- C. Fabricate member with camber built in.
- D. Do not splice or join members in locations other than those indicated without permission.

PART 3 EXECUTION

3.01 ERECTION

- A. Lift members using protective straps to prevent visible damage.
- B. Set structural members level and plumb, in correct positions or sloped where indicated.

END OF SECTION

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**SECTION 062000
FINISH CARPENTRY**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

2.02 LUMBER MATERIALS

- A. Hardwood Lumber: match existing species, match existing sawn, maximum moisture content of 6 percent ; with vertical grain , of quality suitable for transparent finish.

2.03 SHEET MATERIALS

- A. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.04 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Wood Filler: Solvent base, tinted to match surface finish color.

2.05 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.

2.06 SHOP FINISHING

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

PART 3 EXECUTION

3.01 INSTALLATION

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

END OF SECTION

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**SECTION 064100
ARCHITECTURAL WOOD CASEWORK**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- B. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- C. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.02 QUALITY ASSURANCE

- A. Quality Certification:
 - 1. Replace, repair, or rework all work for which certification is refused.

PART 2 PRODUCTS

2.01 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Wood Veneer Faced Cabinet:
 - 1. Exposed Surfaces: HPVA HP-1 Grade A, Ash, plain sliced, random-matched.
 - 2. Semi-Exposed Surfaces: HPVA HP-1 Grade B, Ash, plain sliced, random-matched.
 - 3. Concealed Surfaces: Manufacturer's option.
- C. Cabinets at Servicing Area:
 - 1. Finish - Exposed Exterior Surfaces: Wood.
 - 2. Finish - Semi-Exposed Surfaces: Wood
 - 3. Finish - Concealed Surfaces: Manufacturer's option.
 - 4. Grained Face Layout for Cabinet and Door Fronts: Stile and Rail, all Grades.
 - a. Drawer fronts run grain either vertically or horizontally at the manufacturer's option.
 - b. Doors: Vertical grain.
 - 5. Cabinet Design Series: As indicated on drawings.
 - 6. Adjustable Shelf Loading: 40 psf.
 - a. Deflection: L/144.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 PANEL CORE MATERIALS

- A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.

2.04 HARDWOOD PLYWOOD PANELS

- A. Hardwood Plywood: Plywood manufactured for nonstructural decorative applications; consisting of faces and backs applied to a variety of core types; comply with HPVA HP-1.
 - 1. Face: Birch; grade AA.
 - a. Finish: UV-cured clear topcoat.
 - 2. Back: Balancing backer.

2.05 THERMALLY FUSED LAMINATE PANELS

- A. Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
 - 1. Test in accordance with NEMA LD 3 Section 3.
 - 2. Panel Core Substrate: Particleboard.

2.06 COUNTERTOPS

- A. Countertops: See Section 123600.

2.07 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.

2.08 HARDWARE

- A. Cabinet Hardware: Comply with BHMA A156.9 for hardware types and grades indicated below:
- B. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch spacing adjustments.
- C. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.
- D. Cabinet Catches and Latches:
- E. Drawer Slides:
 - 1. Type: Full extension.
 - 2. Static Load Capacity: Commercial grade.
 - 3. Mounting: Side mounted.
- F. Soft-Close, Door and Drawer Adjustable Dampers:
- G. Hinges: European style concealed self-closing type, steel with nickel-plated finish.

2.09 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
 - 1. Provide center matched panels at each elevation.
- E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.
- F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.10 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.
- C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 1, Lacquer, Nitrocellulose.
 - b. Stain: As selected by Architect.
 - c. Sheen: Flat.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.

END OF SECTION

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**SECTION 064200
WOOD PANELING**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide data on fire-retardant treatment materials and application instructions.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- C. Samples: Submit two samples of finished plywood, 12x 12 inch in size, illustrating wood grain and specified finish.

1.02 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 PANELING

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.

2.02 WOOD-BASED MATERIALS - GENERAL

2.03 WOOD-TREATMENT PROCESSES

- A. Wood Preservative by Pressure Treatment (PT Type): Provide AWPA U1 using waterborne preservative to 0.25 lb/cu ft retention.

2.04 FABRICATION

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

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Do not begin installation until wood materials have been fully acclimated to interior conditions.

END OF SECTION

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**SECTION 071113
BITUMINOUS DAMPPROOFING**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide properties of primer, bitumen, and mastics.

1.02 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 BITUMINOUS DAMPPROOFING

- A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
 - 1. Asphalt-Base Emulsion for Metal Protective Coating: ASTM D1187/D1187M, Type I - Continuous water exposure within few days after drying or Type II - Continuous weather exposure after drying.
 - 2. Emulsified Asphalt for Roofing Protective Coating: ASTM D1227/D1227M, Type II, Class 1 - Mineral colloid emulsifying agents with non-asbestos fibers.
 - 3. VOC Content: Not more than permitted by local, State, and federal regulations.
 - 4. Applied Thickness: 1/16 inch, minimum, wet film.

2.02 ACCESSORIES

- A. Protection Board: Rigid insulation; see Section 072100.

PART 3 EXECUTION

3.01 APPLICATION

- A. Foundation Walls: Apply two coats of asphalt dampproofing.
- B. Foundation Walls: Patch disturbed areas of existing dampproofing with two additional coats of dampproofing of the same generic type.
- C. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- D. Apply from 2 inches below finish grade elevation down to top of footings.

END OF SECTION

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**SECTION 072100
THERMAL INSULATION**

PART 1 GENERAL

1.01 SUBMITTALS

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

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.
- B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- C. Insulation Inside Masonry Cavity Walls: Expanded polystyrene (EPS) board.
- D. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.
 - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 3. Board Size: 48 inch by 96 inch.
 - 4. Board Edges: Square.
 - 5. Water-Resistive Barrier: Integrated film facer on insulation.
 - 6. Type and Compressive Resistance: Type XI, 5 psi (35 kPa), minimum.
 - 7. Type and Water Absorption: Type XI, 4.0 percent by volume, maximum, by total immersion.
- B. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
 - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
 - 5. Board Edges: Square.
 - 6. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Thermal Resistance: R-value of 21.
 - 5. Thickness: 5.5 inch.
 - 6. Facing: Aluminum foil, flame spread 25 rated; one side.

2.04 ACCESSORIES

- A. Interior Vapor Retarder: Modified polyethylene/polyacrylate (PE/PA) film reinforced with polyethylene terephthalate (PET) fibers, 12 mil, 0.012 inch thick.
 - 1. Width: 4.9 feet.
- B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.

1. Application: Sealing of interior circular penetrations, such as pipes or cables.

PART 3 EXECUTION

3.01 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.

3.02 BOARD INSTALLATION AT CAVITY WALLS

- A. Secure insulation fasteners to substrate at following frequency:
 1. Six (6) per insulation board.

3.03 BOARD INSTALLATION UNDER CONCRETE SLABS

- A. Place insulation under slabs on grade after base for slab has been compacted.

3.04 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

END OF SECTION

**SECTION 072500
WEATHER BARRIERS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide data on material characteristics.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIERS

- A. Water-Resistive and Air Barrier, Multilayers: Outer layers of nonwoven, spunbonded polypropylene with vapor permeable, watertight polymeric middle layer.
1. Air Permeance: 0.0011 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
 2. Water Vapor Permeance: 28 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
 3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 3 months of weather exposure.
 4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
 5. Seam and Perimeter Tape: As recommended by sheet manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Install continuous water-resistive barriers where indicated on drawings, with sheets lapped to shed water.
- C. Apply sealants within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Mechanically Fastened Sheets:
1. Install sheets in shingle fashion to shed water; align horizontally.

END OF SECTION

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**SECTION 075400
THERMOPLASTIC MEMBRANE ROOFING**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
- B. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
- C. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.02 QUALITY ASSURANCE

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

1.03 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within five years after installation.
- C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.01 ROOFING - UNBALLASTED APPLICATIONS

- A. Thermoplastic Membrane Roofing: One ply membrane, mechanically fastened, over insulation.
- B. Roofing Assembly Requirements:
 - 1. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value.
 - a. Calculate SRI in accordance with ASTM E1980.
 - b. Field applied coating may not be used to achieve specified SRI.
 - 2. Insulation Thermal Resistance (R-Value): 5 per inch, minimum; provide insulation of thickness required.
- C. Acceptable Insulation Types - Constant Thickness Application: Any of types specified.
 - 1. Minimum 2 layers of polyisocyanurate board.
 - 2. Bottom layer of polyisocyanurate board covered with single layer of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
- D. Acceptable Insulation Types - Tapered Application: Any of types specified.
 - 1. Tapered polyisocyanurate, perlite, or extruded polystyrene board.
 - 2. Tapered polyisocyanurate, perlite, extruded polystyrene, or cellular glass board covered with uniform thickness cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
 - 3. Uniform thickness cellulose, perlite, composite, polyisocyanurate, extruded polystyrene, molded polystyrene, glass fiber, or cellular glass board covered with tapered polyisocyanurate, extruded polystyrene, or perlite board.

2.02 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
 - 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
 - a. Thickness: 60 mil, 0.060 inch, minimum.
 - 2. Sheet Width: Factory fabricated into widest possible sheets.
 - 3. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Membrane Fasteners: As recommended and approved by membrane manufacturer.
- D. Flexible Flashing Material: Same material as membrane.
- E. Through-Wall Flashing: Cold-applied, self-adhering, styrene-butadiene-styrene (SBS) modified rubberized asphalt sheet membrane bonded with high density cross-woven polyethylene film.
- F. Through-Wall Flashing with Termination Bar: At least 40 mil, 0.040 inch thick poly-reinforced membrane with extruded termination bar and drip-edge.

2.03 COVER BOARDS

- A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
 - 1. Thickness: 5/8 inch, Type X, fire-resistant.

2.04 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 - 1. Classifications:
 - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 1, 16 psi (110 kPa), minimum.
 - 2. Board Size: 48 by 96 inches.
 - 3. Board Thickness: 1.5 inches.

2.05 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Roofing Nails: Galvanized, hot-dipped type, size and configuration as required to suit application.
- C. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during cold or wet weather conditions.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.02 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE

- A. Install vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
- B. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

- C. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

3.03 INSTALLATION - MEMBRANE

- A. Mechanical Attachment: Install membrane and mechanical attachment devices in accordance with manufacturer's instructions.
- B. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.

END OF SECTION

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**SECTION 076200
SHEET METAL FLASHING AND TRIM**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.02 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sheet Metal Flashing and Trim:

2.02 SHEET MATERIALS

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.
- B. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 - Brushed finish.

2.03 PREPAINTED, METALLIC-COATED STEEL SHEETS

- A. Description: Factory-applied coatings applied to metallic-coated steel sheet substrates prior to fabrication by coil coating; topcoat systems consist of primers and organic topcoats on exposed, top side of sheet; washcoats on bottom, unexposed sheet side.
- B. Comply with ASTM A755/A755M.
- C. Metallic-Coated Steel Sheet Substrates:
 - 1. Zinc-Coated, Galvanized, Steel Sheets: Commercial steel sheets, galvanized by hot-dip process; comply with ASTM A653/A653M; coating designation G90.
- D. Substrate Preparation for Prefinishing: Clean and prepare substrate surfaces in accordance with coating manufacturer's recommendations for substrate type and application.
- E. Washcoats or Backercoats: Provide washcoats or backercoats in accordance with organic coating manufacturer's recommendations.
- F. Primer Coats: Provide basecoat primers in accordance with coating manufacturer's recommendations for substrate type, topcoat, and application.

2.04 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

2.05 FLASHING

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

2.06 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I, No. 15.
- C. Slip Sheet: Rosin-sized sheathing paper.

- D. Primer Type: Zinc chromate.
- E. Concealed Sealants: Non-curing butyl sealant.
- F. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- G. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.
- H. Reglets: Surface-mounted type, galvanized steel; face and ends covered with plastic tape.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- B. Exterior Flashing Receivers: Install in accordance with manufacturer's recommendations, and in proper relationship with adjacent construction, and as follows:
 - 1. Secure receiver at perimeter of wall opening with adhesives or fasteners.
 - 2. Place flashing into receiver channel.
- C. Seal metal joints watertight.

END OF SECTION

**SECTION 079200
JOINT SEALANTS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
- B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- C. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- D. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.02 QUALITY ASSURANCE

- A. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Deliver sufficient samples to manufacturer for testing.
 - 2. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

1.03 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints:
 - a. Seal open joints except open joints indicated on drawings as not sealed.
 - b. Seal the following joints:
 - 1) Wall expansion and control joints.
 - 2) Joints between doors, windows, and other frames or adjacent construction.
 - 2. Interior Joints:
 - a. Do not seal gaps and openings in gypsum board and suspended ceilings
 - b. Seal the following joints:
 - 1) Joints between door frames and window frames and adjacent construction.
 - 3. Do Not Seal:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be covered with manufactured expansion joint cover assemblies or other covering devices.
 - c. Joints where sealant installation is specified in other sections.

- B. Interior Wet Areas: restrooms and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.02 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.03 NONSAG JOINT SEALANTS

- A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
 - 2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 - 3. Color: Match adjacent finished surfaces.
- B. Silicone Sealant: ASTM C920, Grade NS, Use T; single component, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
 - 1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
- C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Color: White.
- D. Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.
 - 1. Color: Clear.
- E. Nonsag Traffic-Grade Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Color: Match adjacent finished surfaces.

2.04 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install bond breaker backing tape where backer rod cannot be used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

**SECTION 081423
CLAD WOOD DOORS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- C. Samples: Submit two samples of door construction, in size cut from top corner of door.
- D. Samples: Submit two samples of door veneer, in size illustrating wood grain, stain color, and sheen.
- E. Performance Validation: Submit certified label or test report on products as indicated under performance requirements to validate product compliance.

1.02 QUALITY ASSURANCE

1.03 WARRANTY

- A. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 COMPONENTS

- A. Clad Wood Doors: See drawings for locations and additional requirements.
- B. Stile and Rail Clad Wood Doors: Stile and rail wood doors, laminated veneer lumber (LVL) construction with wood veneer, kiln dried and suitable for interior finish as indicated.
 - 1. Provide mortise and tenon joints at each corner with lag screw reinforcement.
- C. Exterior Clad Wood Doors: Water-repellent and preservative-treated lumber in accordance with WDMA I.S. 4.
 - 1. Thickness: 1-3/4 inches, unless otherwise indicated.
 - 2. Exterior Door Cladding: Aluminum sheet as indicated.
 - 3. Exterior Frame Cladding: Extruded aluminum as indicated.
 - 4. Interior Wood Facing, Transparent: Wood veneer with factory finish as indicated.
- D. Configuration: As indicated on drawings.
 - 1. Door Style: As indicated on drawings.
- E. Door Product Type: SHD - Side-hinged door, in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
- F. Integral Wood Frame: Water-repellent and preservative-treated lumber in accordance with WDMA I.S. 4, kiln dried and suitable for stain or painted finish.
 - 1. Frame Depth: As indicated on drawings.
- G. Glazing: Double glazed, clear, high performance Low-E coated, manufacturer's standard gas filled, fully tempered, with glass thicknesses as recommended by manufacturer for specified wind conditions.
 - 1. Fully Tempered Glass: ASTM C1048, Kind FT - Fully Tempered.
 - 2. High Performance Low-E Coating: Magnetron sputtering vapor deposition (MSVD) titanium dioxide (TiO₂) coating, applied to No. 2 surface.
 - 3. Air Space: 3/4 inch.
- H. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
 - 1. Apply silicone glazing sealant to exterior glazing stops as recommended by manufacturer.

2. Apply water repellent treatment to wood glazing stops.
- I. Transom and Sidelight Panels: Same construction and finish as door; same quality levels as door.
- J. Door Stops: Clear preservative treated wood, finished to match frame.
- K. Door Hardware: Manufacturer's standard.
 1. See Section 087100 for balance of hardware not provided by door manufacturer.

2.02 DOOR INTERIOR WOOD FACINGS

- A. Veneer Facing for Transparent Finish: Match Existing, veneer grade in accordance with requirements indicated, and plain sliced (flat cut), with book match between leaves of veneer, and running match of spliced veneer leaves assembled on door or panel face.
- B. Door Edging: Any option allowed by quality standard for grade.
- C. Wood Finish: Factory applied stain with clear satin polyurethane topcoat.
- D. Facing Adhesive: Type I - waterproof.

2.03 DOOR EXTERIOR CLADDING

- A. Aluminum Cladding: 6063-T5 aluminum cladding on exterior side, 0.045 inch minimum thickness, factory fabricated, factory glazed; complete with integral sloped sill/threshold, flashings, and anchorage devices.
- B. Exterior Aluminum Finish: Superior performing organic coatings.
 1. Color: Color as selected by Architect from manufacturer's standard colors.
- C. Aluminum Members: Factory finished; solid corner construction; thermally broken.
- D. Drainage: Provide drainage to exterior for moisture entering joints and glazing spaces and for condensation occurring within frame construction.
- E. Glass Stops: Same material and color as frame, sloped for wash.

2.04 PERFORMANCE REQUIREMENTS

- A. Clad Wood Doors: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific door type:
 1. Performance Class (PC): AW.
- B. Performance Validation: Side hinged doors (SHD) in compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance requirements as indicated, or an independent test report for indicated products itemizing compliance and acceptable by authorities having jurisdiction.

2.05 FABRICATION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

2.06 FACTORY FINISHING - WOOD VENEER INTERIOR FACE

- A. Finish work in accordance with WDMA I.S. 1A for Grade specified and as follows:
 1. Transparent:
 - a. System - TR-2, Catalyzed Lacquer.
 - b. Stain: As selected by Architect.
 - c. Sheen: Flat.

2.07 ALUMINUM FINISHES

- A. Superior Performing Organic Coatings: AAMA 2605, multiple-coat, thermally-cured polyvinylidene fluoride system.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Install exterior doors in accordance with ASTM E2112.
- C. Assemble multiple units before installation in accordance with manufacturer's installation guidelines.
- D. Coordinate installation of doors with installation of integral frames and hardware.

END OF SECTION

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**SECTION 081433
STILE AND RAIL WOOD DOORS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.
- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, and factory finishing criteria.
- C. Samples: Submit two samples of door construction, in size cut from top corner of door.
- D. Samples: Submit two samples of door veneer, in size illustrating wood grain, stain color, and sheen.

1.02 WARRANTY

- A. Interior Doors: Provide manufacturer's warranty for 2 years.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 DOORS

- A. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints. Transparent or opaque finish as indicated on drawings.
- C. Wood veneer facing with factory transparent finish as indicated on drawings.

2.02 DOOR AND PANEL FACINGS

- A. Veneer Facing for Transparent Finish: Match Existing, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
- B. Adhesive: Type I - Waterproof.

2.03 DOOR CONSTRUCTION

- A. Vertical Exposed Edge of Stiles: Of same species as veneer facing.
- B. Panels: Oxford (Match existing).
- C. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

2.04 FINISHES

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 1, Lacquer, Nitrocellulose.
 - b. Stain: As selected by Architect.
 - c. Sheen: Flat.
 - 2. Opaque:

2.05 ACCESSORIES

- A. Glazed Openings:
 - 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
 - 2. Glazing: Single vision units, 1/4 inch thick panes of glass.

- B. Door Hardware: See Section 087100.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standards.
- B. Coordinate installation of doors with installation of frames and hardware.

3.02 TOLERANCES

- A. Comply with specified quality standard for fit, clearance, and joinery tolerances.

END OF SECTION

**SECTION 083313
COILING COUNTER DOORS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.
- B. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

1.02 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose specified in this section and indicated on the drawings.

1.03 WARRANTY

- A. Manufacturer Warranty: Provide 2-year manufacturer warranty for counterbalance shaft assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 COILING COUNTER DOORS

- A. Coiling Counter Metal Doors, Non-Fire-Rated: Aluminum slat curtain.
 - 1. Mounting: Interior face mounted.
 - 2. Provide integral frame and sill of same material and finish.
 - 3. Nominal Slat Size: 1-1/4 inches wide.
 - 4. Slat Profile: Flat, perforated.
 - 5. Finish, Aluminum: Anodized.
 - 6. Color: As selected by Architect from manufacturer's standard range.
 - 7. Guides: Formed track; same material and finish unless otherwise indicated.
 - 8. Hood Enclosure: MATCH SLATS; aluminum.
 - 9. Manual hand chain lift operation.
 - 10. Locking Devices: Slide bolt on inside.

2.02 COMPONENTS

- A. Metal Curtain Construction: Interlocking, single-thickness slats.
- B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
 - 1. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.
- C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
- D. Lock Hardware:
 - 1. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.

PART 3 EXECUTION

3.01 INSTALLATION

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

END OF SECTION

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**SECTION 085200
WOOD WINDOWS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Show component dimensions, anchorage and fasteners, glass, and internal drainage details.
- B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.
- C. Samples: Two samples in size illustrating window frame section.

1.02 WARRANTY

PART 2 PRODUCTS

2.01 WOOD WINDOWS

- A. Wood Windows: Wood frame and sash, factory fabricated and assembled.
 - 1. Exterior Finish: Metal clad, painted.
 - 2. Interior Finish: Transparent: Wood veneer with factory finish.
 - 3. Color: As selected by Architect from manufacturer's standard range.
 - 4. Configuration: As indicated on drawings.
 - 5. Window Product Types: FW - Fixed window, in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 6. Wood Species: Clear pine, preservative treated using treatment type suitable for required finish.
 - 7. Metal Cladding: Formed aluminum, factory finished, factory fit to profile of wood members.
 - 8. Transparent Finish: Scarf joints permitted if wood matches in color and grain texture.

2.02 COMPONENTS

- A. Glazing: Double glazed, clear, Low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.
- B. Frames: 6 inch wide by 1 1/4 inch deep profile; flush solid wood glass stops of screw fastened type, sloped for positive drainage.
- C. Sills: Extruded aluminum, with nominal thickness; sloped for positive drainage; fits under sash and projects at least 1/2 inch beyond exterior face of wall; single piece full width of opening.

2.03 PERFORMANCE REQUIREMENTS

- A. Comply with AAMA/WDMA/CSA 101/I.S.2/A440 requirements for the specific window type in accordance with the following:
 - 1. Performance Class (PC): AW.
- B. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.

2.04 ALUMINUM FINISHES

- A. High Performance Organic Coatings: AAMA 2604, multiple coats, thermally cured fluoropolymer system.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install windows in accordance with ASTM E2112.

- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

END OF SECTION

**SECTION 087100
DOOR HARDWARE**

PART 1 GENERAL

1.01 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
 - 1. Architect.
 - 2. Installer's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Keying Requirements Meeting:
 - 1. Schedule meeting at project site prior to Contractor occupancy.
 - 2. Attendance Required:
 - a. Contractor.
 - b. Owner.
 - c. Architect.
 - d. Hardware Installer.
 - 3. Agenda:
 - 4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:

1.02 SUBMITTALS

- A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- B. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - 2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
 - 3. List groups and suffixes in proper sequence.
 - 4. Provide complete description for each door listed.
 - 5. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
- C. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.03 WARRANTY

- A. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
 - 1. Closers: Five years, minimum.
 - 2. Exit Devices: Three years, minimum.
 - 3. Locksets and Cylinders: Three years, minimum.
 - 4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

- B. Provide door hardware products that comply with the following requirements:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Listed and certified compliant with specified standards by BHMA (CPD).
 - 3. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
- C. Fasteners:
 - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.

2.02 HINGES

- A. Hinges: Comply with BHMA A156.1, Grade 1.
 - 1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - 2. Provide hinges on every swinging door.
 - 3. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 - 4. Provide ball-bearing hinges at each door with closer.
 - 5. Provide non-removable pins on exterior outswinging doors.
 - 6. Provide following quantity of butt hinges for each door:
 - a. Doors From 60 inches High up to 90 inches High: Three hinges.

2.03 FLUSH BOLTS

- A. Flush Bolts: Comply with BHMA A156.16, Grade 1.
 - 1. Flush Bolt Throw: 3/4 inch, minimum.
 - 2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
 - a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
 - 3. Self-Latching Flush Bolts: Automatically latch upon closing of door; manually retracted; located on inactive leaf of pair of doors.
 - 4. Automatic Flush Bolts: Automatically latch upon closing of door; automatic retraction of bolts when active leaf is opened; located on inactive leaf of pair of doors.

2.04 EXIT DEVICES

- A. Exit Devices: Comply with BHMA A156.3, Grade 1.
 - 1. Lever design to match lockset trim.
 - 2. Provide cylinder with cylinder dogging or locking trim.
 - 3. Provide exit devices properly sized for door width and height.
 - 4. Provide strike as recommended by manufacturer for application indicated.
 - 5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

2.05 LOCK CYLINDERS

- A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 - 1. Provide standard, electronic, conventional, full size interchangeable core (FSIC), and small format interchangeable core (SFIC) type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.
 - 2. Provide cylinders from same manufacturer as locking device.
 - 3. Provide cams and/or tailpieces as required for locking devices.

2.06 MORTISE LOCKS

- A. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
 - 1. Latchbolt Throw: 3/4 inch, minimum.
 - 2. Deadbolt Throw: 1 inch, minimum.
 - 3. Backset: 2-3/4 inch unless otherwise indicated.
 - 4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Finish: To match lock or latch.

2.07 AUXILIARY LOCKS (DEADLOCKS)

- A. Auxiliary Locks (Deadlocks): Comply with BHMA A156.36, Grade 1.
 - 1. Type: Mortise.
 - 2. Backset: 2-3/4 inch, unless otherwise indicated.

2.08 COORDINATORS

- A. Coordinators: Provide on doors having closers and self-latching or automatic flush bolts to ensure that inactive door leaf closes before active door leaf.
 - 1. Type: Bar, unless otherwise indicated.
 - 2. Material: Brass, unless otherwise indicated.
 - 3. Ensure that coordination of other door hardware affected by placement of coordinators and carry bar is applied properly for completely operable installation.

2.09 CLOSERS

- A. Closers: Comply with BHMA A156.4, Grade 1.
 - 1. Type: Surface mounted to door.
 - 2. Provide door closer on each exterior door.

2.10 PROTECTION PLATES

- A. Protection Plates: Comply with BHMA A156.6.
- B. Metal Properties: Brass material.
 - 1. Metal, Heavy Duty: Thickness 0.062 inch, minimum.
- C. Edges: Beveled, on four sides unless otherwise indicated.
- D. Fasteners: Countersunk screw fasteners.

2.11 KICK PLATES

- A. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 - 1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.12 DOOR HOLDERS

- A. Door Holders: Comply with BHMA A156.16, Grade 1.
 - 1. Type: Lever, or kick down stop, with rubber bumper at bottom end.
 - 2. Material: Bronze.

2.13 FLOOR STOPS

- A. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Type: Manual hold-open, with pencil floor stop.
 - 2. Material: Brass housing with rubber insert.

2.14 WALL STOPS

- A. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Type: Bumper, concave, wall stop.
 - 2. Material: Brass housing with rubber insert.

2.15 ASTRAGALS

- A. Astragals: Comply with BHMA A156.22.
 - 1. Provide recessed astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
 - 2. Type: Split, two parts, and with sealing gasket.
 - 3. Material: Bronze, with neoprene weatherstripping.

2.16 THRESHOLDS

- A. Thresholds: Comply with BHMA A156.21.
 - 1. Provide threshold at interior doors for transition between two different floor types, and over building expansion joints, unless otherwise indicated.
 - 2. Provide threshold at each exterior door, unless otherwise indicated.
 - 3. Type: Flat surface.
 - 4. Material: Brass .
 - 5. Threshold Surface: Fluted horizontal grooves across full width.
 - 6. Field cut threshold to profile of frame and width of door sill for tight fit.

2.17 WEATHERSTRIPPING AND GASKETING

- A. Weatherstripping and Gasketing: Comply with BHMA A156.22.
 - 1. Head and Jamb Type: Adjustable.
 - 2. Door Sweep Type: Encased in retainer.
 - 3. Material: Brass , with brush weatherstripping.

2.18 COAT HOOKS

- A. Coat Hooks: Provide on room side of door, screw fastened.
- B. Material: Brass.

2.19 SIGNAGE

- A. Signage (Room Name Plates and Numbers): Provide on doors for individuals to easily identify room names and/or numbers.
 - 1. Text Required: "RESTROOM" with symbols and braille text.
 - 2. Material: In plastic or metal with paint used to create necessary text, adhered to door.

2.20 SILENCERS

- A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 - 1. Single Door: Provide three on strike jamb of frame.
 - 2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 - 3. Material: Rubber, gray color.

2.21 VERTICAL ROD COVERS

- A. Vertical Rod Covers: Provides protection from damage or tampering of surface mounted bottom vertical rod of exit device and to accommodate ADA Standards.
 - 1. Length: 12 inch.
 - 2. Material: Brass.

2.22 FINISHES

- A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
 - 1. Primary Finish: 605; bright brass, clear coated, with brass base material (former US equivalent US3); BHMA A156.18.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.

3.02 ADJUSTING

- A. Adjust hardware for smooth operation.

END OF SECTION

**SECTION 092116
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data:
 - 1. Provide data on gypsum board, accessories, and joint finishing system.
 - 2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- B. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. See PART 3 for finishing requirements.

2.02 BOARD MATERIALS

- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required SERVING AREA WALL 4' BEYOND EDGE OF SINK AND ALL WALLS IN RESTROOM.
 - 3. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.

2.03 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: See Section 072100.
- B. Water-Resistive Barrier: See Section 072500.
- C. Vapor Retarder: See Section 072600.
- D. Air Barrier: See Section 072700.

PART 3 EXECUTION

3.01 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.

3.02 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

3.03 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

END OF SECTION

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**SECTION 093000
TILING**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 10 of each type.

1.02 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 TILE

- A. Ceramic Mosaic Tile: ANSI A137.1 standard grade.
 - 1. Color: As selected by Architect from manufacturer's standard range.
- B. Glazed Wall Tile: ANSI A137.1 standard grade.
 - 1. Size: by 12x 24 inch, nominal.
 - 2. Surface Finish: High gloss.
 - 3. Color: As selected by Architect from manufacturer's standard range.
- C. Pressed Floor Tile: ANSI A137.1 standard grade.
 - 1. Thickness: 3/8 inch, nominal.
 - 2. Edges: Cushioned.
 - 3. Surface Finish: Unglazed.
 - 4. Color: As selected by Architect from manufacturer's standard range.
 - 5. Trim Units: Matching bullnose, double bullnose, cove base, and cove shapes in sizes coordinated with field tile.
- D. Porcelain Tile: ANSI A137.1 standard grade.
 - 1. Size: 6 by 48 inch, nominal.
 - 2. Thickness: 5/16 inch.

2.02 TRIM AND ACCESSORIES

- A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.
- B. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
- C. Non-Ceramic Trim: Solid brass, style and dimensions to suit application, set with tile mortar or adhesive.
- D. Thresholds: 2 inches wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.

2.03 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.

2.04 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
 - 1. Applications: Use where indicated on drawings and where no other type of grout is indicated.
 - 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.

2.05 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
 - 1. Applications: Between tile and plumbing fixtures.

2.06 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
 - 1. Crack Resistance: No failure at 1/8 inch gap, minimum.
- B. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 inch thick; 2-inch wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108/A118/A136, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- B. Lay tile to pattern indicated on drawings. Do not interrupt tile pattern through openings.

3.02 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over wood substrates with backer board underlayment, install in accordance with TCNA (HB) Method F144, for cementitious backer boards, with standard grout.
- B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.03 INSTALLATION - WALL TILE

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

END OF SECTION

**SECTION 095100
ACOUSTICAL CEILINGS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Indicate grid layout and related dimensioning.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Manufacturer's qualification statement.

1.02 QUALITY ASSURANCE

1.03 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
 - 1. Local authorities having jurisdiction.

2.02 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
- B. Acoustical Panels: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - a. Form: 2, water felted.
 - b. Pattern: "D" - fissured.
 - 2. Size: 24 by 24 inches.
 - 3. Thickness: 3/4 inch.
 - 4. Panel Edge: Reveal.
 - 5. Color: White.
 - 6. Suspension System: Exposed grid.

2.03 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 - 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dip galvanized steel grid with steel cap.
 - 1. Application(s): Seismic.
 - 2. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
 - 3. Profile: Tee; 15/16 inch face width.
 - 4. Finish: Baked enamel.
 - 5. Color: White.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

- D. Perimeter Moldings: Same metal and finish as grid.
 - 1. Size: As required for installation conditions and specified Seismic Design Category.

PART 3 EXECUTION

3.01 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

END OF SECTION

**SECTION 096429
WOOD STRIP AND PLANK FLOORING**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide data for flooring.
- B. Shop Drawings: Indicate floor joint pattern and termination details.
- C. Samples: Submit two samples 12 by 12 inch in size illustrating floor finish, color, and sheen.

1.02 FIELD CONDITIONS

- A. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.
- B. Maintain minimum room temperature of 65 degrees F for a period of two days prior to delivery of materials to installation space, during installation, and after installation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Wood Strip Flooring:
 - 1. Species: Red oak.
 - 2. Grade: Clear.
 - 3. Cut: Edge grain.
 - 4. Moisture Content: 7 to 9 percent.
 - 5. Actual Thickness: 25/32 inch.
 - 6. Actual Width: 2-1/4 inches.
 - 7. Edge: Tongue and groove.
 - 8. End: End matched.
 - 9. Length: Random, minimum of 9 inches.
 - 10. Treatment: Acrylic impregnated.
 - 11. Factory Finish: MATCH EXSITING stain.
- B. Flooring Nails: Type recommended by flooring manufacturer.
- C. Secondary Subflooring: 23/32 inch thick plywood, APA Rated Sheathing, span rating of _____ with tongue and groove edges; Exposure 1, sanded, preservative treated.
- D. Vapor Retarder: Black polyethylene sheet, 8 mil thick; 2 inch wide tape for joint sealing.
- E. Sheathing Paper: Plain building paper.

2.02 ACCESSORIES

- A. Wood Base: Same species as flooring; profile as indicated.
- B. Floor Finish: Polyurethane, to achieve high gloss surface; type recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Sheathing Paper: Place over wood subfloor; lap edges and ends 2 inches, staple in place.
- B. Wood Flooring:
 - 1. Install in accordance with manufacturer's and NWFA instructions; predrill and blind nail to subfloor.
 - 2. Lay flooring parallel to length of room areas. Verify alignment as work progresses.

END OF SECTION

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**SECTION 096500
RESILIENT FLOORING**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Shop Drawings: Indicate seaming plans and floor patterns.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

PART 2 PRODUCTS

2.01 TILE FLOORING

- A. Vinyl Tile: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
 - 1. Minimum Requirements: Comply with ASTM F1700, Class III.
 - 2. Plank Tile Size: 6 by 48 inch.
 - 3. Wear Layer Thickness: 0.030 inch.
 - 4. Total Thickness: 0.18 inch.
 - 5. Pattern: STAGGER.
 - 6. Color: To be selected by Architect from manufacturer's full range.

2.02 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Moldings, Transition and Edge Strips: Same material as flooring.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Fit joints and butt seams tightly.
 - 2. Set flooring in place, press with heavy roller to attain full adhesion.

3.02 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

END OF SECTION

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**SECTION 099113
EXTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Exposed surfaces of steel lintels and ledge angles.
- B. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Floors, unless specifically indicated.
 - 5. Glass.
 - 6. Concealed pipes, ducts, and conduits.

1.02 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint GE-OP-3L - Exterior Gypsum Board and Exterior Plaster, Opaque, Latex, 3 Coat:
 - 1. One coat of latex primer sealer.
 - 2. Flat: Two coats of latex; soffits.
- B. Paint ME-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
 - 1. One coat of latex primer.
 - 2. Semi-gloss: Two coats of latex enamel; Steel Rails.
- C. Paint MgE-OP-3L - Galvanized Metals, Latex, 3 Coat:
 - 1. One coat galvanize primer.
 - 2. Semi-gloss: Two coats of latex enamel; Channels at windows, exposed flashing.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.02 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

END OF SECTION

**SECTION 099123
INTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- B. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Floors, unless specifically indicated.
 - 5. Glass.
 - 6. Concealed pipes, ducts, and conduits.

PART 2 PRODUCTS

2.01 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 3. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.02 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, uncoated steel, and shop primed steel.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): High Performance Architectural Interior Latex; 139.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.02 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

END OF SECTION

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**SECTION 099300
STAINING AND TRANSPARENT FINISHING**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and catalog number, and general product category.
 - 2. MPI product number (e.g. MPI #33).
 - 3. Manufacturer's installation instructions.
- B. Samples: Two samples on actual wood substrate to be finished, 12 by 12 inch in size, indicating selected colors and sheens for each system, with specified coats cascaded.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide finishes used in any individual system from the same manufacturer; no exceptions.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

- A. Finishes:
 - 1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. Supply each finish material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.03 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

- A. Finish on Wood - Vertical Surfaces:
 - 1. Stain: Semi-transparent stain for wood, water based with polyurethane.
 - 2. Top Coat Sheen:
 - a. Satin: MPI gloss level 4; use this sheen at all locations.
- B. Finish on Wood - Floors:
 - 1. Sealer: Water based, clear.
 - 2. Top Coat: One- or two-component, water based polyurethane.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Sand wood surfaces lightly between coats to achieve required finish.

END OF SECTION

**SECTION 101423
PANEL SIGNAGE**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- B. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
- C. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.
- D. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.02 PANEL SIGNAGE

- A. Panel Signage for all rooms:
 - 1. Application: Room and door signs.
 - 2. Description: Flat signs with engraved panel media, tactile characters.
 - 3. Sign Size: 4 inches by 6 inches.
 - 4. Total Thickness: 1/8 inch.
 - 5. Sign Edges: Radiused.
 - 6. Letter Edges: Squared.
 - 7. Color and Font, unless otherwise indicated:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - b. Character Case: Upper and lower case (title case).
 - c. Background Color: As scheduled.
 - d. Character Color: Contrasting color.
 - 8. Material: Laminated colored plastic engraved through face to expose core as background color.
 - 9. Material: Etched metal.
 - 10. Profile: Flat panel in aluminum frame.
 - a. Frame Finish: Black anodized.
 - 11. Tactile Letters: Raised 1/32 inch minimum.
 - 12. Braille: Grade II, ADA-compliant.
 - 13. One-Sided Wall Mounting: Concealed screws.

2.03 SIGNAGE APPLICATIONS

- A. Room and Door Signs:
 - 1. Office Doors: Identify with room names and numbers to be determined later, not those indicated on drawings; provide "window" section for replaceable occupant name.
 - 2. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
 - 3. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

2.04 ACCESSORIES

- A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide products of each category type by single manufacturer.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide 3 keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Four roll, surface-mounted, stainless steel unit with pivot hinge, tumbler lock.
- B. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
 - 1. Capacity: 500 multifold minimum.
- C. Waste Receptacle: Stainless steel, freestanding style with swing top.
 - 1. Liner: Removable seamless stainless steel receptacle.
 - 2. Minimum capacity: 10 gallons.
- D. Automated Soap Dispenser: Liquid soap dispenser, wall-mounted, with stainless steel cover and window to gauge soap level, tumbler lock.
 - 1. Minimum Capacity: 48 ounces.
- E. Air Freshener Dispenser: Wall-mounted, battery operated.
- F. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
 - 1. Shelf: Stainless steel; gauge and finish to match mirror frame, turned down edges, welded to frame; 5 inches deep, full width of mirror.
- G. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
 - 1. Minimum capacity: 250 seat covers.
- H. Grab Bars: Stainless steel, smooth surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Finish: Satin.

- d. Length and Configuration: As indicated on drawings.
- I. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

- A. Specified in 224000 - Plumbing Fixtures.

2.06 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Polyethylene.
 - 2. Mounting: Surface.
 - 3. Color: Gray.
 - 4. Minimum Rated Load: 250 pounds.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

END OF SECTION

SECTION 123600 COUNTERTOPS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- B. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - b. Color and Pattern: As selected by Architect from manufacturer's full line.
 - 3. Other Components Thickness: 1/2 inch, minimum.
 - 4. Exposed Edge Treatment: Built up to minimum 1 1/2" inch thick; square edge; use marine edge at sinks.
 - 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

2.02 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 ACCESSORIES

2.04 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Apply sealer products in accordance with manufacturer's written instructions.
- C. Seal joint between back/end splashes and vertical surfaces.

END OF SECTION

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**SECTION 220516
EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING**

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS

2.01 EXPANSION LOOPS - HOSE AND BRAID

- A. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support brackets.
- B. Maximum Allowable Motion: 2 inch in the x, y, and z planes with no thrust loads to the building structure.
- C. Maximum Working Pressure: 150 psi at 800 degrees F.
- D. Construction: Class 150, schedule 40, stainless steel hose and braid assembly with carbon steel fittings, including elbows and flanged end connections sized to match pipe segment.
 - 1. Selected Product to Accommodate:
 - a. Angular Rotation: 15 degrees.
 - b. Force developed by 1.5 times specified maximum allowable operating pressure.
 - 2. Provide necessary accessories including, but not limited to, swivel joints.

PART 3 EXECUTION

3.01 INSTALLATION

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

END OF SECTION

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**SECTION 220519
METERS AND GAUGES FOR PLUMBING PIPING**

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

- A. Bourdon Tube for Liquids and Gases:
 - 1. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.
 - 2. Process Connection: Lower-back, 1/4 inch NPT male except where noted.

2.02 THERMOMETERS

- A. General:
 - 1. Product Compliance: ASTM E1.
 - 2. Lens: Clear glass, except where stated.
 - 3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
 - 4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.
- B. Thermometers - Dial Type:
 - 1. Fixed: 5 inch diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch NPT stem.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install pressure gauges as follows:
 - 1. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.
- B. Install thermometers as follows:
 - 1. Hot Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.

END OF SECTION

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**SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING**

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. See drawings for specific valve locations.
- B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- C. Provide the following valves for the applications if not indicated on drawings:
 - 1. Shutoff: Ball, butterfly, gate or plug.
 - 2. Throttling: Provide globe, angle, ball, or butterfly.
 - 3. Swing Check (Pump Outlet):
 - a. 2 inch and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
- D. Required Valve End Connections for Non-Wafer Types:
 - 1. Steel Pipe:
 - a. 2 inch and Smaller: Threaded ends.
- E. Domestic, Hot and Cold Water Valves:
 - 1. 2 inch and Smaller:
 - a. Bronze and Brass: Provide with solder-joint ends.
 - b. Ball: One piece, full port, brass with brass trim.
 - c. Bronze Swing Check: Class 125, bronze disc.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 - 1. Hand Lever: Quarter-turn valves 6 inch and smaller.
- D. Valve-End Connections:
 - 1. Solder Joint Connections: ASME B16.18.
- E. General ASME Compliance:
 - 1. Solder-joint Connections: ASME B16.18.
- F. Potable Water Use:
 - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
 - 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

2.03 BRASS, BALL VALVES

- A. Two Piece, Full Port with Brass Trim and Female Thread, Male thread, or Solder Connections:
 - 1. Comply with MSS SP-110.
 - 2. WSP Rating: 150 psi.
 - 3. WOG Rating: 600 psi.
 - 4. Body: Forged brass.
 - 5. Seats: PTFE.
 - 6. Ball: Chrome-plated brass.
 - 7. Operator: Lockable handle and memory stop.

2.04 BRONZE, BALL VALVES

- A. General:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.

- B. Two Piece, Full Port with Bronze Trim:
 - 1. Comply with MSS SP-110.
 - 2. WSP Rating: 150 psi.
 - 3. WOG Rating: 600 psi.
 - 4. Body: Forged bronze or dezincified-brass alloy.
 - 5. Ends Connections: Pipe thread or solder.
 - 6. Seats: PTFE.

2.05 CARBON STEEL, BALL VALVES

- A. Two Piece, Full Port with Stainless Steel Trim:
 - 1. Comply with MSS SP-110.
 - 2. WSP Rating: 150 psi.
 - 3. CWP Rating: 2,000 psi.
 - 4. Seats: TFM.
 - 5. Stem: Stainless steel, blowout proof.
 - 6. Ball: Stainless steel, vented.
 - 7. End Connections: Threaded or socket weld.
 - 8. Operator: Lockable handle.
 - 9. Pressure and Temperature Rating: ASME B16.34.

2.06 BRASS, INLINE CHECK VALVES

- A. Class 150:
 - 1. Maximum Service Temperature: 250 degrees F.
 - 2. Body: Forged brass.
 - 3. Disc: Forged brass.
 - 4. Seal: PTFE, bubble-tight.
 - 5. End Connections: Soldered.

2.07 BRASS, HORIZONTAL SWING CHECK VALVES

- A. Class 125, Soldered End Connections:
 - 1. WOG Rating: 200 psi.
 - 2. Body: Forged brass.
 - 3. Disc: Forged brass.
 - 4. Hinge-Pin, Screw, and Cap: Forged brass.

2.08 BRONZE, SWING CHECK VALVES

- A. General:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125:
 - 1. Pressure and Temperature Rating: MSS SP-80, Type 3.
 - 2. Design: Y-pattern, horizontal or vertical flow.
 - 3. WOG Rating: 200 psi.
 - 4. Body: Bronze, ASTM B62.
 - 5. End Connections: Soldered.
 - 6. Disc: Bronze.

2.09 FLOW LIMITING VALVES

- A. Size: As indicated on drawings, female threaded.
- B. Flow Setting: As indicated on drawings.
- C. Flow Accuracy: Plus or minus 5 percent.
- D. Body and Cap: Lead-free brass.
- E. Cap and Plug: Lead-free brass.

- F. Cartridge: Stainless steel with replaceable EPDM seal.
- G. Maximum Service Pressure: 600 psi, WOG.
- H. Maximum Service Temperature: 250 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Install check valves where necessary to maintain direction of flow as follows:
 - 1. Lift Check: Install with stem plumb and vertical.
 - 2. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

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**SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
- D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
- E. Materials for Metal Fabricated Supports: Comply with Section 055000.
 - 1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
 - 2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- F. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
 - 1. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

2.02 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

- A. Strut Channels:
 - 1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
 - 2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- B. Hanger Rods:
 - 1. Threaded zinc-plated steel unless otherwise indicated.
 - 2. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Piping up to 1 inch: 1/4 inch diameter.
- C. Channel Nuts:
 - 1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.
- D. Cable Hanging System Kits:
 - 1. Provide cable-wire in bulk or pre-cut lengths with respective cable hangers as required to hold minimum weight of 120 lb.

2.03 BEAM CLAMPS

- A. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- B. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.04 PIPE HANGERS

- A. Band Hangers, Adjustable:
 - 1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

- B. J-Hangers, Adjustable:
 - 1. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
- C. Clevis Hangers, Adjustable:
 - 1. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

2.05 PIPE CLAMPS

- A. Riser Clamps:
 - 1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
 - 2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
 - 3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

2.06 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

- A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- B. Pipe Supports:
 - 1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
 - 2. Liquid Temperatures Up to 122 degrees F:
 - a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
 - b. Support From Below: MSS SP-58 types 35 through 38.
- C. Pipe Supports, Thermal Insulated:
 - 1. General Requirements:
 - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
 - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
 - c. Provide pipe supports for 1/2 to 30 inch iron pipes.
 - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
 - 2. PVC Jacket:
 - a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
 - b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
 - c. Minimum Thickness: 60 mil, 0.06 inch.
- D. Copper Pipe Supports:

2.07 ANCHORS AND FASTENERS

- A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
- B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
- C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
- D. Steel: Use beam ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
- E. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
- F. Wood: Use wood screws.

- G. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - 1. Channel Material: Use galvanized steel.
 - 2. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

END OF SECTION

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SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Nameplates:
 - 1. Heat exchangers, water heaters, and other heat transfer products.
 - 2. Control panels, transducers, and other related control equipment products.
 - 3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.
- B. Pipe Markers: 3/4 inch diameter and higher.

2.02 NAMEPLATES

- A. Description: Laminated piece with up to three lines of text.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.
 - 4. Nameplate Height: 3/4 inch.
 - 5. Nameplate Material:
 - a. Flexible: Vinyl with adhesive backing per ASTM D709.
 - b. Metal: Brass with center-side holes for screw fastening.

2.03 PIPE MARKERS

- A. Comply with ASME A13.1.
- B. Identification Scheme, ASME A13.1:
 - 1. Primary: External Pipe Diameter, Uninsulated or Insulated.
 - a. 3/4 to 1-1/4 inches: Use 8 inch field-length with 1/2 inch text height.
 - 2. Secondary: Color scheme per fluid service.
 - a. Combustible Fluids: White text on brown background.
 - b. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.
 - 3. Tertiary: Other Details.
 - a. Directional flow arrow.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install plastic pipe markers in accordance with manufacturer's instructions.

END OF SECTION

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**SECTION 220716
PLUMBING EQUIPMENT INSULATION**

PART 2 PRODUCTS

1.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

END OF SECTION

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**SECTION 220719
PLUMBING PIPING INSULATION**

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

- A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.

2.03 JACKETING AND ACCESSORIES

- A. Aluminum Jacket:
 - 1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- B. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

END OF SECTION

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**SECTION 220719.11
UNDER-LAVATORY PIPE AND SUPPLY COVERS - PLUMBEREX**

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS

2.01 UNDER-LAVATORY PIPE AND SUPPLY COVERS

- A. General:
 - 1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks per ADA Standards.
- B. ASTM E84 Compliant, Under-Lavatory Insulators:
 - 1. Construction: Soft, non-laminated, flexible PVC with antimicrobial, antifungal, and UV-resistant properties. Fusion molded one piece universal design for multiple P-trap configurations. Adhesives, sewing threads, and two ply laminated materials shall not be allowed. Exterior surfaces shall be smooth nonabsorbent with no finger recessed indentations for easy cleaning. Supply riser shall be flexible and a minimum of 15 inches inches in length.
- C. Under-Lavatory Covers with Snap-Lock Fasteners:
 - 1. Construction: PVC with antimicrobial, antifungal, and UV-resistant properties, one piece injected molded design with internal bridge at top of J-bend to prevent separating.
 - 2. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install under-lavatory guards according to manufacturer's written instructions..

END OF SECTION

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**SECTION 221005
PLUMBING PIPING**

PART 1 GENERAL (NOT USED)

1.01 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D2729.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.
 - 3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.

2.05 STORM DRAINAGE PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.06 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.
- B. Flexible Gas Piping:
 - 1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.
 - 2. Comply with ASTM E84.
 - 3. Fittings: Provided by piping system manufacturer.

2.07 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 inch and Under:
 - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
 - 2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. No-Hub Couplings:
 - 1. Testing: In accordance with ASTM C1277 and CISPI 310.
 - 2. Gasket Material: Neoprene complying with ASTM C564.
 - 3. Band Material: Stainless steel.

- 4. Eyelet Material: Stainless steel.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.08 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
- C. Plumbing Piping - Water:
 - 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

2.09 BALL VALVES

- A. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.10 BALANCING VALVES

- A. Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- B. Manual Operated Y-Pattern Globe, Size 1/2 to 2 inch:
 - 1. Class 125, brass or bronze body, multi-turn handwheel, memory stop, variable orifice, soldered connections, dual PT (hot and cold pressure-temperature) test ports for 300 psi, minus 4 to 250 deg F WOG service.
- C. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.
- H. Install water piping to ASME B31.9.
- I. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- J. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

- K. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.

3.02 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction.

3.03 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 330110.58.

END OF SECTION

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**SECTION 221006
PLUMBING PIPING SPECIALTIES**

PART 2 PRODUCTS

1.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

1.02 DRAINS

- A. Roof Drains:
 - 1. Assembly: ASME A112.6.4.
 - 2. Body: Lacquered cast iron with sump.
 - 3. Strainer: Removable polyethylene dome with vandal proof screws.
- B. Roof Overflow Drains:
- C. Downspout Nozzles:
 - 1. Bronze round with straight bottom section.
- D. Floor Drain (FD-1):
 - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

1.03 CLEANOUTS

- A. Cleanouts at Exterior Surfaced Areas:
 - 1. Round cast nickel bronze access frame and non-skid cover.
- B. Cleanouts at Interior Finished Floor Areas:
 - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- C. Cleanouts at Interior Finished Wall Areas:
 - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

1.04 WATER HAMMER ARRESTORS

- A. Water Hammer Arrestors:
 - 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

1.05 MIXING VALVES

- A. Water Temperature Limiting Valves:
 - 1. Valve: ASSE 1070, bronze or brass body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment with high-temperature limit stop; integral check valves with strainer screens on inlets.

1.06 RELIEF VALVES

- A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

1.07 FLOOR DRAIN TRAP SEALS

- A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 EXECUTION

2.01 INSTALLATION

- A. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- B. Encase exterior cleanouts in concrete flush with grade.
- C. Install floor cleanouts at elevation to accommodate finished floor.

END OF SECTION

**SECTION 223000
PLUMBING EQUIPMENT**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data:
 - 1. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on materials of fabrication, assembly of components, dimensions, weights, capabilities, performance, electrical characteristics, location and sizes of connections, service and access locations, and manufacturer-provided and field-installed accessories.

PART 2 PRODUCTS

2.01 IN-LINE CIRCULATOR PUMPS

- A. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- B. Impeller: Bronze.
- C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- D. Seal: Carbon rotating against a stationary ceramic seat.
- E. Drive: Flexible coupling.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.
- B. Electrical Work: Provide automatic control and protective devices with associated wiring to interconnect related interfaced devices required for specified operation.
- C. Coordinate system, equipment, and piping work with applicable electrical, fuel, gas, vent, drain, and waste support interconnections as included or provided by other trades.
- D. Pumps:
 - 1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
 - 2. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION

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**SECTION 224000
PLUMBING FIXTURES**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 TANK TYPE WATER CLOSETS

- A. Floor-Mounted Bowl:
 - 1. ASME A112.19.2; siphon jet, vitreous china, 16.5 inches high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
 - 2. Water Consumption: 1.6 gal per flush, maximum.
- B. Toilet Seats:
 - 1. Plastic: Solid, white, elongated, open front, hinged seat cover, extended back with self-sustaining hinges, and brass bolts with covers.

2.03 LAVATORIES

- A. Wall-Hung Basin:
 - 1. Vitreous China, Grade A: ASME A112.19.2; white, rectangular commercial-grade sink with predrilled holes, rear-center drain, front overflow, and hanger. Size as indicated on drawings with 4-inch centerset spacing.
 - 2. Carrier:
 - a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
- B. Supply Faucet:
 - 1. Single-Lever Handle, Supply Faucet: ASME A112.18.1; deck-mount, ceramic cartridge disc valve, and maximum flow of 0.5 gpm, low-flow.
- C. Accessories:
 - 1. Chrome-plated 17 gauge, 0.0538 inch brass P-trap with clean-out plug and arm with escutcheon.

2.04 SINKS

- A. Double Compartment Bowl:
 - 1. ASME A112.19.3; 18 gauge, 0.050 inch thick, type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
 - 2. Drain: 3-1/2 inch crumb cup and tailpiece.
- B. Kitchen Faucets:
- C. Commercial Kitchen, Double Lever Handle Faucet:
 - 1. Type: Deck-mount, high arc faucet with mounting plate.
 - 2. Spray Type: Full stream spray at 1.5 gpm, maximum.
 - 3. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
 - 4. Materials: Stainless steel disc valve on brass body with polished chrome finish.
- D. Accessories: Provide braided water supply lines, slip-joint p-trap, and stainless steel basket strainer.

2.05 UNDER-LAVATORY PIPE SUPPLY COVERS

- A. General:
 - 1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
 - 2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
 - a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
 - b. Comply with ICC A117.1.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome-plated rigid or flexible supplies to fixtures with loose-key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

END OF SECTION

**SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Prefabricated Trapeze-Framed Metal Strut Systems:
1. MFMA-4 compliant, prefabricated, side-loading continuous-slot metal strut channel bracket with associated tracks, fittings, and related accessories.
 2. Strut Channel or Bracket Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
 4. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
 5. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.
- C. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
 2. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Piping up to 1 inch: 1/4 inch diameter.
 - c. Piping larger than 1 inch: 3/8 inch diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
- D. Steel Cable:
- E. Cable Hanging System Kits:
1. Provide cable-wire in bulk or precut lengths with respective cable hangers as required to hold minimum weight of 120 lb.
 2. Accessories: Provide brackets, clip or c-clip hangers, covers, and y-hook hangers.
- F. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
7. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
8. Sheet Metal: Use sheet metal screws.
9. Wood: Use wood screws.
10. Plastic and lead anchors are not permitted.
11. Powder-actuated fasteners are not permitted.
12. Hammer-driven anchors and fasteners are not permitted.
13. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
14. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

END OF SECTION

**SECTION 230548
VIBRATION AND SEISMIC CONTROLS FOR HVAC**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

1.02 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.
 - 1. Designer may be employed by the manufacturer of the seismic restraint products.

PART 2 PRODUCTS

2.01 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

2.02 SEISMIC RESTRAINT SYSTEMS

- A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.
- B. Cable Restraints:
 - 1. Comply with ASCE 19.
 - 2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
 - 3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
 - 4. Use protective thimbles for cable loops where potential for cable damage exists.
- C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

2.03 VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS

2.04 IN-CURB SOUND ATTENUATION TREATMENT

- A. Description: Prefabricated composite acoustical panels for installation in equipment curb. Designed to attenuate sound transfer from mechanical equipment into spaces below curb.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- D. Seismic Controls:
 - 1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
 - 2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
 - 3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
 - 4. Equipment with Sheet Metal Housings:
 - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.

- b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
 - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Seismic Restraint Systems:
- a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
 - b. Install restraints within permissible angles in accordance with seismic design.
 - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
 - d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
 - e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Thermostats: Nameplates.

2.02 NAMEPLATES

- A. Letter Color: White.
- B. Letter Height: 1/4 inch.
- C. Background Color: Black.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

END OF SECTION

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**SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to the Commissioning Authority.
 - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
- C. Field Logs: Submit at least twice a week to the Commissioning Authority.
- D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Submit to the the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
 - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. SMACNA (TAB).
 - 4. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.

3. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 4. Duct systems are clean of debris.
 5. Fans are rotating correctly.
 6. Access doors are closed and duct end caps are in place.
 7. Air outlets are installed and connected.
 8. Duct system leakage is minimized.
 9. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

3.06 COMMISSIONING

- A. Perform prerequisites prior to starting commissioning activities.
- B. Fill out Prefunctional Checklists for:
1. Air side systems.
- C. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.
- D. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for ____ percent of the air handlers plus a random sample equivalent to ____ percent of the final TAB report data as directed by Commissioning Authority.
1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
 2. Use the same test instruments as used in the original TAB work.
 3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
 4. For purposes of re-check, failure is defined as follows:
 - a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
 - b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
 - c. Temperatures: Deviation of more than one degree F.
 - d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.

- e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
- 5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.
- E. In the presence of the Commissioning Authority, verify that:
 - 1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
 - 2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

3.07 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Forced Air Furnaces.
 - 2. Packaged Roof Top Heating/Cooling Units.
 - 3. Fans.
 - 4. Air Inlets and Outlets.

3.08 MINIMUM DATA TO BE REPORTED

- A. Return Air/Outside Air:
 - 1. Identification/location.
 - 2. Design outside air flow.
 - 3. Actual outside air flow.
- B. Exhaust Fans:
 - 1. Location.
 - 2. Manufacturer.
 - 3. Model number.
 - 4. Serial number.
 - 5. Air flow, specified and actual.
 - 6. Fan RPM.

END OF SECTION

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**SECTION 230713
DUCT INSULATION**

PART 1 GENERAL

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C553; flexible, noncombustible blanket.
- B. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
- C. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- D. Indoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 JACKETING AND ACCESSORIES

- A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.

2.04 DUCT LINER

- A. Note: Choose the liner type - Elastomeric Foam, Glass Fiber, or Phenolic Foam.
- B. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
 - 1. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
 - 2. Service Temperature: Up to 250 degrees F.
 - 3. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch Thickness: 0.30.
 - b. 1 inch Thickness: 0.45.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NAIMA National Insulation Standards.

END OF SECTION

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**SECTION 230800
COMMISSIONING OF HVAC**

PART 1 GENERAL

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

END OF SECTION

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**SECTION 233100
HVAC DUCTS AND CASINGS**

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct unless otherwise indicated.
- C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.
- D. Seismic Restraint: Fabricate in compliance with ICC (IMC) requirements; see Section 230548.
- E. Duct Shape and Material in accordance with Allowed Static Pressure Range:
 - 1. Round Supply: Plus 2 in-wc of galvanized steel.
 - 2. Rectangular Supply: Plus 2 in-wc of galvanized steel.
 - 3. Round Exhaust: Plus or minus 1 in-wc of galvanized steel.
 - 4. Rectangular Return: Minus 1 in-wc of galvanized steel.
 - 5. Flexible Duct (Fabric and wire): Plus or minus 1/2 in-wc; see Section 233700.
- F. Duct Sealing and Leakage in accordance with Static Pressure Class:
 - 1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
 - a. Supply Air: 1 in-wc pressure class, galvanized steel.
 - b. Return and Relief Air: 1/2 in-wc pressure class, galvanized steel.
 - c. General Exhaust Air: 1/2 in-wc pressure class, galvanized steel.
 - 2. Low Pressure Service: Up to 2 in-wc:
 - a. Seal: Class C, apply to seal off transverse joints.
 - b. Leakage:
 - 1) Rectangular: Class 24 or 24 cfm/100 sq ft.
 - 2) Round: Class 12 or 12 cfm/100 sq ft.
- G. Duct Fabrication Requirements:
 - 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
 - 2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
 - 3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
 - 4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
 - 5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 - 6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
 - 7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 METAL DUCTS

- A. Material Requirements:
 - 1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

- B. Rectangular Metal Duct:
 - 1. Rectangular Single Wall: Rectangular, longitudinal lock seam duct with galvanized steel wall.
- C. Round Metal Ducts:
 - 1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
 - 2. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).
- D. Round Spiral Duct:
 - 1. Round spiral lock seam duct with galvanized steel outer wall.
- E. Connectors, Fittings, Sealants, and Miscellaneous:
 - 1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
 - 2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
 - 3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 - c. For Use with Flexible Ducts: UL labeled.
 - 4. Gasket Tape:
 - a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
 - 5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
 - 6. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:
 - a. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - b. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 - c. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 - d. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 - e. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
 - f. Other Types: As required.

2.03 FLEXIBLE DUCTS

- A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
 - 1. Insulation: R6 insulation with polyethylene vapor barrier film.
 - 2. Pressure Rating: 10 in-wc positive and 5 in-wc negative.
 - 3. Maximum Velocity: 5500 fpm.
 - 4. Temperature Range: Minus 20 degrees F to 250 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

END OF SECTION

**SECTION 233300
AIR DUCT ACCESSORIES**

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

- A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.02 BACKDRAFT DAMPERS - METAL

- A. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.03 BACKDRAFT DAMPERS - FABRIC

- A. Fabric Backdraft Dampers: Factory-fabricated.
 - 1. Blades: Neoprene coated fabric material.
 - 2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
 - 3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

2.04 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 FLEXIBLE DUCT CONNECTORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.

2.06 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Splitter Dampers:
 - 1. Material: Same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.
 - 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
- C. Single Blade Dampers:
 - 1. Fabricate for duct sizes up to 6 by 30 inch.
 - 2. Blade: 24 gauge, 0.0239 inch, minimum.
- D. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
 - 1. Blade: 18 gauge, 0.0478 inch, minimum.
- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- E. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.
- F. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

**SECTION 233319
DUCT SILENCERS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance.
- B. Shop Drawings: Indicate assembly, materials, thicknesses, dimensional data, pressure losses, acoustical performance, layout, and connection details.
- C. Design Data: Provide engineering calculations, referenced to specifications and AHRI 270, AMCA 301, AMCA 302, AMCA 303, and ANSI S12.1 standards indicating that maximum room sound levels are not exceeded.
- D. Test Reports: Indicate dynamic insertion loss and noise generation values of silencers.

1.02 QUALITY ASSURANCE

- A. Perform Work in accordance with AHRI 575, AMCA 300, or ANSI S1.13 standards and recommendations of ASHRAE Std 68.

PART 2 PRODUCTS

2.01 DUCT SILENCERS

- A. Description: Duct section with sheet metal outer casing, sound absorbing fill material, and inner casing of perforated sheet metal; incorporating interior baffles of similar construction. Fabricate in accordance with SMACNA (DCS) HVAC Duct Construction Standards.
- B. Materials:
 - 1. Outer Casing: Minimum 22 gauge, 0.0299 inch thick galvanized steel stiffened as required, with mastic filled lock formed seams, 2 inch long, 11 gauge, 0.1196 inch slip joints on both ends.
 - 2. Inner Casing and Splitters: Minimum 24 gauge, 0.0239 thick perforated galvanized steel.
 - 3. Fill: Glass fiber or mineral wool of minimum 4 lb/cu ft density.
 - 4. Fill Liner: Bonded glass fiber matting.

2.02 DUCTWORK LAGGING

- A. Thickness: 2 inches, maximum.
- B. Acoustic Insulation: Composed of glass fiber.
- C. Covering: Foil facing.
- D. Sound Transmission Class: Not less than 20 when tested in accordance with ASTM E90.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Support duct silencers independent of ducts with flexible duct connections, lagged with leaded vinyl sheet on inlet and outlet. See Section 233100 and Section 233300.
- B. Where indicated, lag ductwork by wrapping with insulation and covering. Apply covering to be air tight. Do not attach covering rigidly to ductwork.

END OF SECTION

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**SECTION 233423
HVAC POWER VENTILATORS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: Comply with AMCA 204.
- B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
- C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.
- D. Fabrication: Comply with AMCA 99.
- E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.02 CABINET EXHAUST FANS

- A. Centrifugal Fan Unit: Direct driven with galvanized steel housing, resiliently mounted motor, gravity backdraft damper in discharge.
- B. Grille: Aluminum.
- C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is reached with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.
- D. Performance Ratings: As indicated on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- C. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

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**SECTION 233700
AIR OUTLETS AND INLETS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- B. Project Record Documents: Record actual locations of air outlets and inlets.

1.02 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

PART 2 PRODUCTS

2.01 RECTANGULAR CEILING DIFFUSERS

- A. Type: Provide rectangular and square formed adjustable, backpan stamped, core removable, and multi-louvered ceiling diffusers constructed to maintain 360 degree discharge air pattern with sectorizing baffles where indicated.
- B. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabrication: Aluminum with baked enamel finish.

2.02 CEILING SLOT DIFFUSERS

- A. Type: Continuous 3/4 inch wide slot, three slots wide, with adjustable vanes for left, right, or vertical discharge.
- B. Fabrication: Aluminum extrusions with factory clear lacquer finish.
- C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket, mitered end border.
- D. Plenum: Integral, galvanized steel, insulated.

2.03 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

- A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.
- B. Fabrication: Grid core consists of aluminum with mill aluminum finish.
- C. Frame: 1-1/4 inch margin with countersunk screw mounting.
- D. Frame: Channel lay-in frame for suspended grid ceilings.
- E. Accessories: Provide integral gang and face operated opposed blade damper, 2 inch filter frame, plaster frame, square mesh insect screen, square mesh debris screen, prescored molded fiberglass back, and 45 degree angled eggcrate or other similar provisions for visual blocking such as angled louver or 90 degree duct elbow.

2.04 GRAVITY VENTILATORS

- A. Hood Relief Gravity Ventilator:
 - 1. General:
 - a. Low silhouette for relief applications with natural gravity or negative pressure system(s).
 - b. Performance ratings and factory testing in accordance with AMCA 511 and AMCA 550.
 - c. Equipment to bear permanently affixed manufacturer's nameplate listing model and serial number.
 - 2. Hood and Base:
 - a. Material: Aluminum.
 - 3. Birdscreen:
 - a. Fabricate in accordance with ASTM B221 (ASTM B221M).

- b. Construction: 1/2 inch Galvanized mesh.
- 4. Hood Support: Galvanized steel construction and fastened so hood can be removed completely from base or hinged open.
- 5. Options/Accessories:
 - a. Roof Curbs:
 - 1) Flat Roofs:
 - (a) Welded, straight side curb with flashing flange and wood nailer.
 - b. Dampers:
 - 1) Type: Gravity.
 - 2) Factory designed to prevents outside air from entering back into building when fan is off.
 - 3) Balanced for minimal resistance to flow.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

3.02 CLOSEOUT ACTIVITIES

- A. Demonstrate operational system to Owner's representative.
- B. Instruct Owner's representative to maintain system and use occupant controls or interfaces, as required.

3.03 PROTECTION

- A. Protect installed products until completion of project.
- B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION

SECTION 237413
PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Filters: One set for each unit.

1.02 QUALITY ASSURANCE

1.03 WARRANTY

- A. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. General: Roof mounted units having gas burner and electric refrigeration.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

2.02 FABRICATION

- A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners. Structural members shall be minimum 18 gauge, 0.0478 inch, with access doors or panels of minimum 20 gauge, 0.0359 inch.
- B. Heat Exchangers: Stainless steel, of welded construction.
- C. Supply and Return Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted high efficiency motor or direct drive; see Section 230548. Isolate complete fan assembly.
- D. Air Filters:
 - 1. 2 inch thick glass fiber disposable media in metal frames. MERV 13 minimum rating.
- E. Seismic Roof Mounting Curb: 14 inches high galvanized steel, channel frame with gaskets, nailer strips.

2.03 BURNER

- A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.
- B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.
- C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

2.04 EVAPORATOR COIL

- A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

- B. Provide capillary tubes or thermostatic expansion valves for units of 6 Tons of refrigeration capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 Tons of refrigeration cooling capacity and larger.

2.05 COMPRESSOR

- A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

2.06 CONDENSER COIL

- A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.
- B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.07 MIXED AIR CASING

- A. Dampers: Provide manual outside and return air dampers for fixed outside air quantity.
- B. Gaskets: Provide tight fitting dampers with edge gaskets.

2.08 OPERATING CONTROLS

- A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.
 - 1. Include system selector switch (heat-off-cool) and fan control switch (auto-on).
 - 2. Locate thermostat in room side.
- B. Provide night control energized by central time clock to maintain lower thermostat setting, lock out refrigeration, close outside air damper and open return air damper, stop supply air fan, for night and unoccupied operation. Provide time delay to maintain outside air damper closed and return air damper open after switching to day and occupied operation.
- C. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
- D. Control Valves: Field-installed, modulating, ball type with position tracking; see Section 253519.

2.09 OPERATING CONTROLS - SINGLE ZONE UNITS

- A. Electric solid state microcomputer based room thermostat, located as indicated in service area with remote sensor located as indicated.
- B. Room thermostat shall incorporate:
 - 1. Automatic switching from heating to cooling.
 - 2. Instant override of set point for continuous or timed period from one hour to 31 days.
 - 3. Short cycle protection.
 - 4. Programming based on weekdays, Saturday and Sunday.
- C. Room thermostat display shall include:
 - 1. Time of day.
 - 2. Actual room temperature.
 - 3. Programmed temperature.
 - 4. Programmed time.
 - 5. Duration of timed override.
 - 6. Day of week.
 - 7. System model indication: heating, cooling, auto, off, fan auto, fan on.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 90A.

3.02 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation.

END OF SECTION

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**SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 PREPARATION

- A. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- B. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

END OF SECTION

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SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL (NOT USED)

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
 - 1. Where not otherwise restricted, may be used:
 - a. For overhead service drop, installed in raceway to service head.
- F. Armored cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 260526.
- H. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
- I. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - 3. Color Code:
 - a. 240/120 V, 1 Phase, 3 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. Travelers for 3-Way and 4-Way Switching: Pink.

- d. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
- D. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

2.05 ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
 - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
- B. Wire Pulling Lubricant:
 - 1. Listed and labeled as complying with UL 267.
 - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 - 3. Suitable for use at installation temperature.
- C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Circuiting Requirements:
 - 1. Include circuit lengths required to install connected devices within 10 ft of location indicated.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- E. Install conductors with a minimum of 12 inches of slack at each outlet.

- F. Make wiring connections using specified wiring connectors.
- G. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- H. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- I. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

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SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
 - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
- F. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
- D. Ground Rod Electrodes:
 - 1. Comply with NEMA GR 1.
 - 2. Material: Copper-bonded (copper-clad) steel.
 - 3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
- D. Make grounding and bonding connections using specified connectors.
 - 1. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

END OF SECTION

**SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - b. Requirements of authorities having jurisdiction.
 - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
 - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- D. Metal Channel/Strut Framing Systems:
 - 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 - 2. Comply with MFMA-4.
 - 3. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.
 - 4. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - 5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
 - 6. Minimum Channel Dimensions: 1-5/8 inch wide by 13/16 inch high.
- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2-inch diameter.
 - b. Busway Supports: 1/2-inch diameter.

- c. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
 - d. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
 - e. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
- F. Anchors and Fasteners:
- 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
 - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 - 4. Hollow Masonry: Use toggle bolts.
 - 5. Hollow Stud Walls: Use toggle bolts.
 - 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
 - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

END OF SECTION

**SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- D. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- E. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).

2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.
- C. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for purpose intended.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
 3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.
- D. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.
- E. Conduit Routing:
 1. Conceal conduits unless specifically indicated to be exposed.
 2. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
 3. Arrange conduit to provide no more than 150 feet between pull points.
 4. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
- F. Conduit Support:
 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
- G. Connections and Terminations:
 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 4. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
- H. Penetrations:
 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 3. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

4. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
5. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.
- I. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where conduits are subject to earth movement by settlement or frost.
- J. Conduit Sealing:
 1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.
 - c. Where conduits enter building from underground.
 - d. Where conduits may transport moisture to contact live parts.
 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
 - a. Where conduits pass from outdoors into conditioned interior spaces.
 - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

END OF SECTION

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SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

1.02 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 - 3. Use suitable concrete type boxes where flush-mounted in concrete.
 - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 - 6. Use shallow boxes where required by the type of wall construction.
 - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 - 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 - 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 - 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
 - 1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - 2. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

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

- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
 - 2. Locate boxes so that wall plates do not span different building finishes.
 - 3. Locate boxes so that wall plates do not cross masonry joints.
 - 4. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
- E. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- F. Install boxes as required to preserve insulation integrity.
- G. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- H. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUBMITTALS

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
 - c. Centralized Emergency Lighting Inverters:
 - 1) Identify input and output voltage and phase.
 - 2) Identify power source and circuit number for normal power source. Include location when not within sight of equipment.
 - 2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - 3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
 - 4. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
 - 5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
 - 6. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
- B. Identification Labels:
 - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 - 1. Materials:
 - 2. Minimum Size: 7 by 10 inches unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

END OF SECTION

**SECTION 262416
PANELBOARDS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
- C. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

PART 2 PRODUCTS

2.01 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Listed series ratings are not acceptable.
- C. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- D. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- E. Conductor Terminations: Suitable for use with the conductors to be installed.
- F. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 - 1. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 2. Fronts:
 - 3. Lockable Doors: All locks keyed alike unless otherwise indicated.
- G. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.02 LOAD CENTERS

- A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.
- B. Bussing:
 - 1. Bus Material: Aluminum or copper.
- C. Circuit Breakers: Thermal magnetic plug-in type.
- D. Enclosures:
 - 1. Provide flush-mounted enclosures unless otherwise indicated.
 - 2. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
6. Do not use tandem circuit breakers.
7. Do not use handle ties in lieu of multi-pole circuit breakers.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- G. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Provide filler plates to cover unused spaces in panelboards.

END OF SECTION

**SECTION 262726
WIRING DEVICES**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.02 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 WIRING DEVICES - GENERAL REQUIREMENTS

- A. Provide wiring devices suitable for intended use with ratings adequate for load served.
- B. Wiring Device Finishes:
 - 1. Provide wiring device finishes as described below, unless otherwise indicated.
 - 2. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

2.02 WALL PLATES AND COVERS

- A. Wall Plates: Comply with UL 514D.
 - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 - 2. Size: Standard.
 - 3. Screws: Metal with slotted heads finished to match wall plate finish.
 - 4. Provide screwless wallplates with concealed mounting hardware where indicated.
- B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches above finished floor.
 - b. Wall Dimmers: 48 inches above finished floor.
 - c. Receptacles: 18 inches above finished floor or 6 inches above counter.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- F. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

END OF SECTION

**SECTION 262813
FUSES**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

PART 2 PRODUCTS

2.01 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
- H. Class J Fuses: Comply with UL 248-8.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

**SECTION 262816.16
ENCLOSED SWITCHES**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

PART 2 PRODUCTS

2.01 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; general duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Horsepower Rating: Suitable for connected load.
- D. Voltage Rating: Suitable for circuit voltage.
- E. Short Circuit Current Rating:
- F. Conductor Terminations: Suitable for use with the conductors to be installed.
- G. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
- I. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- J. General Duty Switches:
 - 1. Conductor Terminations:
 - a. Provide mechanical lugs.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- F. Provide grounding and bonding in accordance with Section 260526.

END OF SECTION

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**SECTION 265100
INTERIOR LIGHTING**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
- B. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.03 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Battery:
 - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

2.04 EXIT SIGNS

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
 - 1. Self-Powered Exit Signs:
 - a. Battery: Sealed, maintenance-free, nickel cadmium unless otherwise indicated.
 - b. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

END OF SECTION

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