PROJECT MANUAL
WILLIAMSON COUNTY
MAGISTRATE COURT

306 WEST 4TH STREET

GEORGETOWN, TEXAS 78626

July 27, 2022

TALEX, INC., ENGINEERS

TX FIRM 3271

CERTIFICATION
WilCo Magistrate Court
Williamson County, Texas

I hereby certify that the Architectural specifications for this project were prepared by me, or under my direct supervision, and that I am a duly registered Architect under the laws of the State of Texas.

07-26-22

The Texas Board of Architectural Examiners, P.O. Box 12337, Austin, Texas 78711-2337 or 333 Guadalupe, Suite 2-350, Austin, Texas 78701-3942, (512) 305-9000, has jurisdiction over individuals licensed under the Architects' Registration Law, Texas Civil Statutes, Article 249A.

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SECTION 01 21 00

ALLOWANCES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.
   1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Field Order.

B. Types of allowances include the following:
   1. Contingency allowances.

C. Related Sections:
   1. Divisions 01 through 49 Sections for items of Work covered by allowances.

1.03 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.04 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Field Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.05 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.06 CONTINGENCY ALLOWANCES

A. Use the contingency allowance (hardware) only as directed by Architect for Owner's purposes and only by Field Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Field Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order, to be initiated by the Architect.

1.07 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Field Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   1. Include installation costs in purchase amount only where indicated as part of the allowance.
   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
   3. Submit substantiation of a change in scope of work, if any, claimed in Field Orders related to unit-cost allowances.
   4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
   1. Do not include Contractor's or subcontractor's indirect expense in the Field Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
   2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.02 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.03 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Include a Contingency (Hardware) Allowance of $90,000.00 for General Purpose and Security Hardware. Coordinate hardware requirements with the owner. Section 08 71 00, Door Hardware will require concurrence by the owner prior to ordering.

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

B. Related Requirements:
   1. Division 1 Section "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
   2. Division 1 Section "Execution Requirements" for cutting and patching procedures.
   3. Division 2 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed, and salvaged, or removed and reinstalled.

1.04 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

1.06 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.07 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.08 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.09 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 PRODUCTS

2.01 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE Al0.6 and NFPA 241.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner.
   5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed

to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Division 7 Sections for new roofing requirements.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.07 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 03 53 00

CONCRETE TOPPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Emery-aggregate concrete floor topping.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR TOPPINGS

A. Emery-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded, crushed emery aggregate containing not less than 50 percent aluminum oxide, not less than 24 percent ferric oxide, and not more than 8 percent silica; portland cement or blended hydraulic cement; plasticizers; and other admixtures to which only water needs to be added at Project site.
   1. Laticrete International, Inc.
   2. Dayton Superior.
   3. Compressive Strength (28 Days): 10,000 psi (69 MPa); ASTM C109/C109M.

2.02 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, 25 percent solids content, minimum.

2.03 RELATED MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II.

B. Sand: ASTM C404, fine aggregate passing No. 16 (1.18-mm) sieve.

C. Water: Potable.

D. Acrylic-Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

E. Epoxy Adhesive: ASTM C881/C881M, Type V, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

2.04 MIXING

A. Bonding Slurry:
   1. Mix portland cement with water to a thick paint consistency.

B. Floor Topping: Mix concrete floor topping materials and water in appropriate drum-type batch machine mixer or truck mixer according to manufacturer's written instructions.

PART 3 EXECUTION

3.01 PREPARATION

A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch (6 mm).
   1. Prepare and clean existing base slabs according to concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
   2. Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch (13 mm) and fill with semirigid joint filler.
   3. To both sides of joint edges and at perimeter of existing base slab, mechanically remove a 4-inch- (100-mm-) wide and 0- to 1-inch- (0- to 25-mm-) deep, tapered wedge of concrete and retexture surface.

B. Install joint-filler strips where topping abuts vertical surfaces.

3.02 FLOOR TOPPING APPLICATION

A. Start floor topping application in presence of manufacturer's technical representative.

B. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch (1.6 to 3 mm), without puddling. Place floor topping while adhesive is still tacky.

C. Place concrete floor topping continuously in a single layer, tamping, and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.

D. Screed surface with a straightedge and strike off to correct elevations.

E. Slope surfaces uniformly where indicated.

F. Begin initial floating, using bull floats to form a uniform and open-textured surface plane free of humps or hollows.

G. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.
   1. Hard Trowel Finish: After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel without allowing blisters to develop. Continue troweling passes and restraighten until surface is smooth and uniform in texture.

H. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.

3.03 PROTECTING AND CURING

A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.

B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.

C. Begin curing immediately after finishing concrete floor topping. Cure by one or a combination of the following methods, according to concrete floor topping manufacturer's written instructions:
   1. Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller according to manufacturer's written instructions.

3.04 JOINT FILLING

A. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.

B. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.

3.05 REPAIR

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Concrete masonry units.
   2. Mortar and grout.
   3. Steel reinforcing bars
   4. Ties and anchors.
   5. Embedded flashing.
   6. Miscellaneous masonry accessories.

B. Related Sections:
   1. Division 08 Section for hollow metal frames in unit masonry openings.

1.03 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 PERFORMANCE REQUIREMENTS

A. Provide concrete unit masonry that develops the following net-area compressive strengths at 28 days.
   1. f'm = 1900 psi.

1.05 SUBMITIALS

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

B. Samples for Initial Selection:
   1. Unit masonry samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.

C. Samples for Verification: For each type and color of the following:
   1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.

2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
3. Weep holes and vents.
4. Accessories embedded in masonry.

D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

E. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

1.06 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for each type of exposed unit masonry construction in sizes approximately 60 inches long by 60 inches high by full thickness, including face and backup wythes and accessories.
a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
b. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
c. Include studs, sheathing, building wrap, sheathing joint-and-penetration treatment air barrier, veneer anchors, flashing,cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location,cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.08 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wait surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 PRODUCTS

2.01 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

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

1. Concrete Masonry Units:
   a. Featherlite Building Products.
   b. Jewell Concrete Company.

2.02 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for sills, water table, mushroom caps, lintels, corners, jambs, sashes, movement joints, headers, bonding,and other special conditions.
2. Provide bullnose-edged units for outside corners where indicated.

B. Standard CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Density Classification: Standard weight.
3. Size (Width): As indicated.
4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.03 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast Untels before handling and installing. Temporarily support built-in-place lintels until cured.

2.04 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

E. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.

F. Aggregate for Grout: ASTM C 404.

G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.

H. Water: Potable.

2.05 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: STM A 615/A 61SM or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
   1. Interior Walls: Hot-dip galvanized, carbon steel.
   2. Exterior Walls: Hot-dip galvanized, carbon steel or Stainless steel.
   3. Wire Size for Veneer Ties: 0.187-inch diameter.
   4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
   5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:
   1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches wide, plus 1 side rod at each wythe of masonry 4 inches wide or less.

2.06 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
   1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
   2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304 or Type 316.
   3. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
   4. Steel Sheet, Galvanized after Fabrication: ASTM A 1008, Commercial Steel, with ASTM A 153, Class B coating.
   5. Stainless-Steel Sheet: ASTM A 666, Type 304 or Type 316.
   6. Steel Plates, Shapes, and Bars: ASTM A 36.
   7. Stainless-Steel Bars: ASTM A 276 or ASTM a 666, Type 304.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Masonry-Veneer Anchors:
   1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
      a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
   2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         (i) Dayton Superior Corporation, Dur-0-Wal Division; D/A 213.
         (ii) Heckmann Building Products Inc.;Pos-1-Tie.
         (iii) Hohmann & Barnard, Inc.; DW-10 DW-IOHS or DW-10-X.
      b. Anchor Section: Manufacturer's standard sheet metal plate.
      c. Fabricate sheet metal anchor sections and other sheet metal parts from minimum 0.075-inch thick, steel sheet, galvanized after fabrication.
      d. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187- inch diameter, hot-dip galvanized steel or stainless-steel wire.
   3. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   (i) ITW Buildex; Teks Maxiseal with Climaseal finish.
   (ii) Textron Inc.,Textron Fastening Systems; Elco Dril-Flex with Stalgard finish.

4. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon- steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10. diameter by length required to penetrate steel stud flange with not less than three exposed threads.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      (i) Dayton Superior Corporation, Dur-0-Wal Division; Stainless Steel SX Fastener.
      (ii) ITW Buildex; Scots long life Teks.

2.07 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of dimensions indicated.

D. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Load Capacity: Capable of sustaining,without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
   3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (AI) stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.08 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2AI; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.09 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime mortar unless otherwise indicated.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
   1. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated,use Type N.

C. Pigmented Mortar: Use colored cement product.
   1. Pigments shall not exceed 10 percent of portland cement by weight.
   2. Mix to match Architect's sample.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
   1. Mix to match Architect's sample.

E. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
   3. Provide grout with a slump of 8 to 11 inche as measured according to ASTM C 143.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

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

3.02 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing,bonding,color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.03 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
   2. .For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets.

B. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

C. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

F. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

G. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. At fire-rated partitions, treat joint between top of partition and underside of structure.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and CMUs as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

E.

3.06 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing,pipe enclosures, and other special conditions.

3.07 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
5. Space anchors as indicated, but not more than 16 inches o.c. vertically and 18 inches o.c. horizontally with not less than 1anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.08 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.09 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

END OF SECTION

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Framing with dimension lumber.
   2. Wood blocking, cants, and nailers.
   3. Wood furring and grounds.
   4. Wood sleepers.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.03 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Fire-retardant-treated wood.
   2. Power-driven fasteners.

PART 2 PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.[Do not use inorganic boron (SBX) for sill plates.]

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
   1. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

C. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.04 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction, Stud, or No. 3 grade of any species.

B. Other Framing: Construction, Stud, or No. 3 grade of any of the following species:
   1. Hem-fir (north); NLGA.
   2. Southern pine; SPIB.
   3. Douglas fir-larch; WCLIB or WWPA.
   4. Spruce-pine-fir; NLGA.
   5. Douglas fir-south; WWPA.
   6. Hem-fir; WCLIB or WWPA.
   7. Douglas fir-larch (north); NLGA.
   8. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.05 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Furring.
   4. Grounds.

B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.

C. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:
   1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
   2. Eastern softwoods, No. 2 Common grade; NELMA.
   3. Northern species, No. 2 Common grade; NLGA.

4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.06 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M of Type 304 stainless steel.

B. Screws for Fastening to Metal Framing: ASTM C1002, length as recommended by screw manufacturer for material being fastened.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.07 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Do not splice structural members between supports unless otherwise indicated.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

G. PROTECTION

H. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 42 16

FLUSH WOOD PANELING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Flush wood paneling (wood-veneer wall surfacing).
2. Fire-retardant-treated materials.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: For flush wood paneling.
1. Include plans, elevations, sections, and attachment details.
2. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: For each exposed product and for each color and finish specified.

1.04 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program.

B. Research reports.

1.05 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 PANELING FABRICATORS

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling and wood trim.

2.02 PANELING, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of flush wood paneling (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.
   1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.

2.03 FLUSH WOOD PANELING (WOOD-VENEER WALL SURFACING)

A. Grade: Custom.

B. Wood Species and Cut: Red oak, rift sliced.

C. Veneer Matching Method:
   1. Adjacent Veneer Leaves and within Panel Face: Slip, center-balance, or book match.

D. Panel-Matching Method:

E. Premanufactured panel sets used full width within each separate area.

F. Panel Core Construction: Hardwood veneer-core plywood.

G. Thickness: As indicated on Drawings.

H. Exposed Panel Edges: Applied solid-wood banding 11/16 inch (18 mm) thick by depth of panels.

I. Panel Reveals: Matte black plastic laminate.

J. Fire-Retardant-Treated Paneling: Panels shall consist of wood-veneer and fire-retardant particleboard or fire-retardant, medium-density fiberboard (MDF). Panels shall have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E84, and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

K. Assemble panels by gluing and concealed fastening.

L. MATERIALS

M. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

N. Wood Moisture Content: 8 to 13 percent.

O. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

P. MDF: ANSI A208.2, Grade 130.

Q. Particleboard: ANSI A208.1, Grade M-2 .

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

2.04 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. INSTALLATION MATERIALS

C. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

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

E. Installation Adhesive: Product recommended by panel fabricator for each substrate for secure anchorage.

2.05 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site.

C. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items.

2.06 SHOP FINISHING

A. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished paneling specified to be field finished. See Section 09 93 00 "Staining and Transparent Finishing" for material and application requirements.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
   1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling.

C. Transparent Finish:
   1. Grade: Custom.
   2. Finish: System - 4, water-based latex acrylic.
   3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
   4. Staining: Match Architect's sample.
   5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
   6. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 EXECUTION

3.01 INSTALLATION

A. Before installation, condition paneling to humidity conditions in installation areas.

B. Grade: Install paneling to comply with quality standard grade of paneling to be installed.

C. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Install with no more than 1/16 inch in 96-inch (1.6 mm in 2400-mm) vertical cup or bow and 1/8 inch in 96-inch (3 mm in 2400-mm) horizontal variation from a true plane.
   1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/16 inch (1.5 mm).

D. Anchor paneling to supporting substrate with concealed panel-hanger clips.

E. Do not use face fastening unless covered by trim.

F. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling. Fill nail holes with matching filler where exposed.

G. See Section 09 93 00 "Staining and Transparent Finishing" for final finishing of installed paneling.

END OF SECTION

SECTION 07 21 00

BUILDING INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes: Glass-fiber blanket insulation.

1.03 SUBMITTALS

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

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.04 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.05 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. CertainTeed Corporation.
   2. Johns Manville.
   3. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
   5. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
      a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.

b. For unfaced blankets at roof framing, hold in place with poultry netting.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation.

3.04 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.05 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 84 43

JOINT FIRESTOPPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Joints in or between fire-resistance-rated constructions.
   2. Joints at exterior curtain-wall/floor intersections.
   3. Joints in smoke barriers.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
   1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.04 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.05 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
   1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
3. Joint firestopping systems shall bear classification marking of a qualified testing agency.
    (i) UL in its "Fire Resistance Directory."
    (ii) Intertek Group in its "Directory of Listed Building Products."

2.02 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.
1. Subject to compliance with requirements, provide joint firestopping systems by the following or approved equal:
    a. 3M Fire Protection Products.
    b. Hilti, Inc.
    c. Tremco, Inc.
    d. Owens Corning.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
1. Manufacturers: Subject to compliance with requirements, provide joint firestopping systems by the following or approved equal:
    a. 3M Fire Protection Products.
    b. Hilti, Inc.
    c. Owens Corning.
    d. Tremco, Inc.
2. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.

D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

E. Accessories: Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 EXECUTION

3.01 INSTALLATION

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

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

C. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

D. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:
   1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
   2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
   3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.02 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer's name.

3.03 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Urethane joint sealants.
   3. Mildew-resistant joint sealants.
   4. Butyl joint sealants.
   5. Latex joint sealants.

1.03 ACTION SUBMITTALS

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

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

C. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Sample Warranties: For special warranties.

1.05 QUALITY ASSURANCE

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

B. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.06 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.07 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.01 JOINT SEALANTS, GENERAL

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

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
   1. Architectural sealants shall have a VOC content of 250 g/L or less.
   2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.

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

2.02 SILICONE JOINT SEALANTS

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

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Dow Corning Corporation #795.
    b. GE Construction Sealants; Momentive Performance Materials Inc.: Silpruf.

2.03 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 35, NT: Single-component, nonsag, nontraffic-use, plus 35 percent and minus 35 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. BASF Construction Chemicals - Construction Systems Sonolastic NP-1.

B. Urethane, S, P, 25, T: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Use T.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. BASF Construction Chemicals - Construction Systems Sonolastic SL-1.

2.04 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid- curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Dow Corning Corporation.
    b. GE Construction Sealants; Momentive Performance Materials Inc.

2.05 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

2.06 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. BASF Construction Chemicals - Construction Systems.
      b. Pecora Corporation.
      c. Sherwin-Williams Company (The).

2.07 JOINT-SEALANT BACKING

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

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

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

2.08 MISCELLANEOUS MATERIALS

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

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

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

PART 3 PART 3 - EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

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

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    a. Metal.
    b. Glass.
    c. Glazed surfaces of ceramic tile.

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

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

3.03 INSTALLATION OF JOINT SEALANTS

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

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

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

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.04 CLEANING

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

3.05 PROTECTION

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

3.06 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior and interior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints in brick pavers.

b. Isolation and contraction joints in cast-in-place concrete slabs.
c. Joints between plant-precast architectural concrete paving units.
d. Joints in stone paving units, including steps.
e. Tile control and expansion joints.
f. Joints between different materials listed above.
g. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, M, 0.

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

1. Joint Locations:
a. Construction joints in cast-in-place concrete.
b. Joints between plant-precast architectural concrete units.
c. Control and expansion joints in unit masonry.
d. Joints in dimension stone cladding.
e. Joints in glass unit masonry assemblies.
f. Joints in exterior insulation and finish systems.
g. Joints between metal panels.
h. Joints between different materials listed above.
i. Perimeter joints between materials listed above and frames of doors windows and louvers.
j. Control and expansion joints in ceilings and other overhead surfaces.
k. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 35, NT.

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

1. Joint Locations:
a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.

D. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:
a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
1. Interior standard steel doors and frames.
2. Interior custom hollow-metal doors and frames.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include the following:
1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.03 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Field quality control reports.

1.04 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements provide hollow metal doors and frames by the following:
1. Ceco Door, Assa Abloy.
2. Curries Company, Assa Abloy.
3. DKS Steel Door & Frames System.
4. Republic Doors and Frames.

2.02 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
   1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.03 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule.
   1. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches.
      c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
      d. Edge Construction: Model 1, Full Flush.
      e. Core: Manufacturer's standard.
      f. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated doors.
   2. Frames:
      a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
      b. Frames: Fabricated from same thickness material as adjacent door frame.
      c. Construction: Full profile welded.

C. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule.
   1. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches.
      c. Face: Uncoated steel sheet, minimum thickness of 0.053 inch.
      d. Edge Construction: Model 1, Full Flush .
      e. Core: Manufacturer's standard.
      f. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated doors.
   2. Frames:
      a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
      b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
      c. Construction: Full profile welded.

D. Maximum-Duty Doors and Frames: ANSI/SDI A250.8, Level 4; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule.
   1. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches.
      c. Face: Uncoated steel sheet, minimum thickness of 0.067 inch.
      d. Edge Construction: Model 1, Full Flush.
      e. Core: Manufacturer's standard.
      f. Fire-Rated Core: Manufacturer's standard vertical steel stiffener laminated mineral board core for fire-rated and temperature-rise-rated doors.
   2. Frames:
      a. Materials: Uncoated steel sheet, minimum thickness of 0.067 inch.
      b. Frames: Fabricated from same thickness material as adjacent door frame.
      c. Construction: Full profile welded.

2.04 FRAME ANCHORS

A. Jamb Anchors:
   1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
   2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
   3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

2.05 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.06 FABRICATION

A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
   1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding, or by rigid mechanical anchors.
   2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
      a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
      b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
   1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
   4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.07 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.02 INSTALLATION

A. Hollow-Metal Frames: Comply with NAAMM-HMMA 840 and NAAMM-HMMA 863.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
   a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
   b. Install frames with removable stops located on secure side of opening.
2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.
   a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
4. Solidly pack mineral-fiber insulation inside frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
6. In-Place Concrete or Masonry Construction: Secure frames in place with post installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with NAAMM-HMMA 841 and NAAMM-HMMA 863, NAAMM-HMMA guide specification indicated.
2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
3. Smoke-Control Doors: Install doors in accordance with NFPA 105.

C. Glazing: Comply with installation requirements in Section 08 "Glazing" and with hollow-metal manufacturer's written instructions.

3.03 FIELD QUALITY CONTROL

A. Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:
1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.04 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 08 42 33

REVOLVING DOOR ENTRANCES

PART 1 GENERAL

1.01 SUMMARY

A. This section includes the following types of revolving entrance doors:
   1. Four wing access control revolving door including enclosure walls and canopy.

B. Related Sections:
   1. Division 7 Sections for caulking to the extent not specified in this section.
   2. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for entrances furnished separately in Division 8 Section.
   3. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
   4. Division 26 Sections for electrical connections including conduit and wiring for revolving door entrance operators and lighting.
   5. Division 28 Sections for access control devices.

1.02 REFERENCES

A. References: Refer to the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 101 - Life Safety Code.

B. American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA).
   1. ANSI/BHMA A156.27 American National Standard for Power and Manual Operated Revolving Pedestrian Doors.
   2. ANSI Z97.1 Standards for Safety Glazing Material Used in Buildings.

C. American Society for Testing and Materials (ASTM).
   1. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
   2. ASTM B209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

D. American Architectural Manufacturers Association (AAMA).
   1. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.

E. National Association of Architectural Metal Manufacturers (NAAMM).
   1. Metal Finishes Manual for Architectural Metal Products.

F. International Code Council (ICC).
   1. IBC: International Building Code.

1.03 DEFINITIONS

A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to activate the operation of the door.

B. Safety Device: A device that detects the presence of an object or person within a zone where contact could occur and provides a signal to stop the movement of the door.

1.04 PERFORMANCE REQUIREMENTS

A. Compliance with the following:
   1. ANSI/BHMA A156.27 American National Standard for Power and Manual Operated Revolving Pedestrian Doors.

B. Thermal Movements: Provide revolving entrance doors that allow for thermal movements resulting from maximum change in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

C. Emergency Exit door requirements: Comply with requirements of authorities having jurisdiction for revolving entrance doors serving as a required means of egress.

D. Breakout Force Requirements:
   1. Revolving doors shall be provided with a mechanism that allows emergency breakout of door panels when a maximum force of 130 lbs (570 N) applied 3 inches (75 mm) from the outer edge of the door panel and 40 inches (1020 mm) above the floor, unless otherwise allowed by ANSI/BHMA A156.27.

E. Revolving door entrances shall have a mechanism that controls the speed of the rotating door panels to the maximum allowable revolutions per minute (RPM) as specified by ANSI/BHMA A156.27.

1.05 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, fabrication, operational descriptions and finishes.

B. Shop Drawings: Submit manufacturer’s shop drawings, including elevations, sections and details, indicating dimensions, materials, and fabrication of doors, enclosure wall, canopy, operator, activation sensors, safety sensors, anchors, hardware, finish, options and accessories.

C. Samples: Submit manufacturer’s samples of aluminum finish.

D. Informational Submittals: Manufacturer's product information and applicable sustainability program credits that are available to contribute towards a LEED rated project certification.

1. Credit MR 4.1 and 4.2: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section.

E. Manufacturers Field Reports: Submit manufacturer's field reports from AAADM certified technician of inspection and approval of doors for compliance with ANSI/BHMA A156.27 after completion of installation.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door opening installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the entrance and their nearest service representatives. The final copies delivered after completion of the installation test to include spare parts list.

G. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.06 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage a qualified manufacturer with a minimum of ten (10) years of documented experience in manufacturing revolving door systems similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum three (3) years documented experience installing and maintenance of units similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Certified Inspector Qualifications: Certified by AAADM.

D. Source Limitations for Revolving Door Entrances: Obtain each type of door, frame, operator and sensor components specified in this Section from a single source, same manufacturer unless otherwise indicated.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings to receive revolving door entrances by field measurements before fabrication and indicate on shop drawings.

1.08 COORDINATION

A. Coordinate sizes and locations of recesses in concrete floors for recessed tracks and thresholds if applicable. Concrete work is specified in Division 03.

B. Electrical System Roughing-in: Coordinate layout and installation of revolving door entrances with connections to the electrical systems including fire detection and access control systems as applicable.

1.09 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Revolving Door Entrances shall be free of defects in material and workmanship for a period of One (1) year from the date of substantial completion.

C. During the warranty period a factory-trained technician shall perform service and affect repairs. An inspection shall be performed after each adjustment or repair.

D. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal business hours.

E. Manufacturer shall have in place a dispatch procedure that shall be available 24 hours a Day, 7 Days a week for emergency call back service.

PART 2 PRODUCTS

A. MANUFACTURER
1. Manufacturer: ASSA ABLOY Entrance Systems, 1900 Airport Road, Monroe, NC 28110. Toll Free (877) SPEC-123. Fax (704) 290- 5555 Website www.assaabloyentrance.com contact: specdesk.na.aaes@assaabloy.com

   Alan Whitmire
   210-278-2263; Alan.Whitmire@assaabloy.com

B. Substitutions: or approved equal.

2.02 REVOLVING DOOR ENTRANCES

A. Revolving door entrances including the following:
1. Aluminum framed in-fill panel revolving doors.
2. Radiused enclosure walls.
3. Entrance canopy and roof.
4. Overhead concealed electro-mechanical operator.
5. Microprocessor controlled revolving door control system.
6. Controls and accessories as required for a complete installation.

2.03 REVOLVING DOOR ENTRANCE COMPONENTS

A. Three Wing and Four Wing Access Control Revolving Door Entrances:
1. Circular Enclosure Walls and Canopy: Slim line aluminum extrusion framing with a minimum wall thickness of 0.125 inches. Framing for the enclosure walls and canopy shall be formed to the required radius. All internal structural support shall be slim line aluminum construction.
   a. Segmented walls and canopy shall not be allowed.

b. Metal-wrapped wood substrate or other metal-wrapped material substrates shall not be allowed.
2. Rotating Wings: Aluminum extrusion framed infill panels.
3. Center Post: Extruded aluminum, finished to match door wings.
4. Emergency Escape Doors: Doors in rotating wings shall be as follows:
   a. Four (4) double acting swing door panels.
   b. Door wings shall have electro-magnetic locking that hold the door panels in a closed position.
5. Weather Stripping: Natural horse hair and synthetic fiber brush shall provide continuous horizontal and vertical seals during both the rotating mode and the non-rotating closed position to insure limited air infiltration.
6. Canopy: Manufacturer's standard canopy construction, size and layout matching diameter of enclosure walls, with formed metal panel sides of material and finish matching enclosure walls, unless otherwise indicated.
   a. Aluminum sheet roof, finish as indicated.
7. Rotating Ceiling: 5/8" laminate faced insulation board.
   a. Ceiling panels must be removable and serve as access hatches.
8. Ceiling Lights: 5 watt, 3000K LED MR16 lamp, 12VAC/DC. Flush mounted ceiling light fixtures in quantity as indicated. (203-220VAC, AC light fixtures shall not be acceptable).
   a. Light activation control via the program selection switch or from optional remote location.
   b. Six (6) LED light fixtures.
9. Infill Panels: Curved walls and curved rotating doors shall be infilled panels formed to the required radius to assure a weather seal throughout enclosure.

2.04 REVOLVING DOOR OPERATOR AND CONTROLS

A. Controls must be microprocessor based "plug-in type" electronics (hard wired systems are not acceptable) with self-diagnostics and digital display status indicator. Digital display status indicator must be located on the interior left of the curved outside wall system. System must be capable of providing information indicating door status, source or probable cause plus remedy.

B. Three Wing and Four Wing Access Control Revolving Door Entrances:
1. Drive Assembly: Center shaft driven by a worm gear reducer with one 1/4 HP DC permanent magnet motor. The drive assembly allows manual rotation, when there is no power to the motor for fail safe operation. Drive assembly shall not permit door speed to be over ridden beyond the set operational speed.
   a. Power Requirements - shall be (1) 208-220 VAC, 20 Amp, 60HZ line, and (1) 115-120 VAC, 50/60 Hz.
   b. UPS battery backup to provide power that will allow continuous operation of revolving door for up to one (1) hour. The UPS battery backup system shall support USB, HTTP, DMI, and SNMP protocol for remote monitoring.
2. Self-Monitoring Function: Supervision of all systems must be performed by the Micro-processor Control Unit (MCU) by conducting "self-monitoring" continuously. Malfunction of any device shall cause the door to stop and the error code shall be indicated on the diagnostic display of the Micro-processor Control Unit MCU.

a. Doors without the "self-monitoring function" will be considered unsafe and will not be acceptable.

3. Program Control Device (PCD):
   a. Provide one (1) program control device (PCD) on the interior left vertical jamb of the curved wall. PCD shall provide seven (7) functions including locked in closed position, entry/exit with activation by access control device (one-way or two-way operation as specified), free entry/free exit, no entry/free exit, manual operation (forward/reverse).
   b. The PCD utilizes entry code access and does not require key operation during normal use of the door system.
   c. The buffer memory is a function of the microprocessor that records the last 600 operational events of the door system.
   d. The PCD provides visual displays to notify the user of operational codes.
   e. The real time clock is programmable for 3 different day schedules, 10 different operation modes per day schedule, weekly schedules and up to 16 exceptions for holidays.

2.05 ACTIVATION AND SAFETY CONTROL DEVICES

A. Three Wing and Four Wing Access Control Revolving Door Entrances:
   1. Activation Units:
      a. Revolving door shall be activated by access control devices allowing the following type of operation (access control devices by others):
         (i) Two-way access control operation: access controlled entry and exit (two access control devices required).
         (ii) Refer to Program Control Device (PCD) for other modes of operation not controlled by the access control device(s).
      b. Automatic Operation: Signal from the access control device activates the unit and revolves the door up to one turn, and then returns door wings to home position.
   2. Safety Control Devices:
      a. Provide primary and/or secondary safety devices located vertically at the entrances and force-sensitive door leaves. All devices shall be incorporated as follows:
         (i) Vertical Safety Sensors:
            (a) Two (2) total compressible safety switches on the outer drum wall entrances. Activation shall cause the door to stop and reverse.
         (ii) Force-Sensitive Door Leaves:
            (a) When an obstacle prohibits or slows rotation of the door, (at a value higher than the pre-set resistance of the door) rotation will stall and cease for 3 seconds. If no obstacle is detected after 3 seconds, the rotation of the door will resume.
         (iii) Emergency Stop:
            (a) The revolving door shall include one (1) emergency stop push button. When the button is pressed, the rotation shall stop.
         (iv) Slow Speed Push Plates:
            (a) The revolving door shall include two (2) handicapped "push to slow" push plates. When the push plate is pressed, the rotation speed will be reduced.

3. Emergency Escape Operation:
    a. Loss of power and/or fire alarm input will initiate the release of the electro-magnetic lock allowing for the door panels to be manually pushed to the emergency egress position.
4. Monitoring Sensors:
    a. Anti-Tailgating: Overhead sensors monitor passage of authorized users. Overhead sensor will detect an unauthorized user attempting passage in a separate quadrant as an authorized user enters. If an unauthorized user is detected, the door will stop revolving preventing entry of either user, a voice annunciator will announce "security violation", and the door will reverse backing the unauthorized user into the area that he came from. The door will then resume allowing the authorized user to enter.
    b. Anti-Piggy Backing: The Besam Secure360 overhead sensor system monitors passage of authorized users. The Secure360 overhead sensors detect suspicious activity, such as piggybacking (two people in the same quadrant) and tailgating (an unauthorized person attempting to use a separate quadrant). If a suspicious activity is detected, the door will stop revolving thus preventing entry of unauthorized users and a voice annunciator will announce "security violation".
    c. Overhead monitoring sensors shall be located in the ceiling of secure compartments.

2.06 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Curved Enclosure Finish:
1. Anodized Finish:
    a. AAMA 611, Dark Bronze, AA-M12C22A44, Class I, 0.018 mm.

C. Rotating Enclosure Finish:
1. Anodized Finish:
    a. AAMA 611, Dark Bronze, AA-M12C22A44, Class I, 0.018 mm.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine the opening to receive the revolving door entrance with the Installer present, for compliance with requirements for installation tolerances, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections.

C. Proceed only after such discrepancies or conflicts have been resolved.

3.02 INSTALLATION

A. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.

B. Entrances: Install revolving door entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
   1. Install revolving door entrances in accordance with manufacturer's printed instructions and recommendations.
   2. Install surface mounted hardware using concealed fasteners to greatest extent possible.
   3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the assembly to exterior.

C. Door Operators: Connect door operators and lighting to electrical power distribution system as specified in Division 26 Sections.
   1. Connect to access control systems as specified in Division 28 Sections.

D. Glazing: Glaze revolving door entrances in accordance with the Glass Association of North America (GANA) Glazing Manual, published recommendations of glass product manufacturer, and published instructions of automatic entrance system manufacturer.

E. Sealants: Comply with requirements specified in division 7 Section "Joint Sealants" to provide a weather tight installation.
   1. Set sill members, flashings, and framing members in full bed of sealant.
   2. Seal perimeter of framing members with sealant.

F. Signage: Apply signage on both sides of each door as required by ANSI/BHMA A156.27 and manufacturers installation instructions.

3.03 ADJUSTING

A. Adjust door operators, controls and hardware for smooth and safe operation and for weather tight closure. Adjust doors in compliance with ANSI/BHMA A156.27.

3.04 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
   1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
   2. Submit documentation of incomplete items in the following formats:
      a. PDF electronic file.
      b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door installation.

B. Clean glass and metal surfaces promptly after installation. Remove excess sealants, compounds, dirt and other substances. Repair damages to match original finish.

3.06 DEMONSTRATION

A. Engage a factory-authorized representative to train Owner's maintenance personnel to adjust, operate, and maintain safe operation of the revolving door entrance.

END OF SECTION

SECTION 08 43 13

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Aluminum-framed storefront systems.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For aluminum-framed storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples: For each type of exposed finish required.

D. Delegated-Design Submittal: For aluminum-framed storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AGM) contractors and that employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components

and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Kawneer.

B. Old Castle.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Aluminum-framed storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Loosening or weakening of fasteners, attachments, and other components.
      d. Failure of operating units.

C. Structural Loads:
   1. Other Design Loads: 5 psf.

D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:
   1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches.
   2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

E. Structural: Test in accordance with ASTM E330/E330M as follows:
   1. When tested at positive and negative wind-load design pressures, storefront assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

2.03 ALUMINUM-FRAMED STOREFRONT SYSTEMS

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. .
   2. Interior Vestibule Framing Construction: Nonthermal.
   3. Glazing System: Retained mechanically with gaskets on four sides.
   4. Glazing Plane: Center.
   5. Finish: Color anodic finish.
   6. Fabrication Method: Field-fabricated stick system.
   7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   8. Steel Reinforcement: As required by manufacturer.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstinging, nonferrous shims for aligning system components.

2.04 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

2.05 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:
   1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
   2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.06 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Physical and thermal isolation of glazing from framing members.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Provisions for field replacement of glazing from interior.
   6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.07 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
   1. Color: Match Architect's sample.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:
   1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
   2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 92 00 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.02 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 08 80 00 "Glazing."

END OF SECTION

SECTION 08 66 00

DETENTION / SECURITY WINDOWS - STEEL FIXED DETENTION WINDOW

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and install detention/security windows as shown in the contract drawings. Work shall include but not be limited to steel windows, closures, trim, anchors and factory applied finishes (if required).

1.02 RELATED WORK

A. Detention and Security Glazing: Section 08 88 53

B. Perimeter caulking and sealing: Section 07 90 00

C. Anchors built-in or masonry embeds: Section 05 50 00

1.03 QUALITY ASSURANCE, PERFORMANCE REQUIREMENTS

A. Windows shall meet or exceed the following standards:
   1. Air Infiltration Test
      a. ASTM E283-04(2012) – Maximum air infiltration
      b. 0.15 CFM/FT of crack length with a pressure differential across the windows of 1.56 PSF (25 MPH).
   2. Impact Test
      a. ASTM F1592-12 – Glazing Test – The glazing and panels shall remain in place. No damage to the extent that forcible entry can be achieved. Frame Test – No welded joints or the entire frame joint shall completely separate. The wall anchoring shall retain the frame in place throughout the test procedure to the extent that forcible entry cannot be achieved.

1.04 SUBMITTALS

A. Submit shop drawings showing window and installation details, including anchorage, fastening, and recommended sealing methods. Show dimensioned elevations with opening and window sizes. Upon request, provide test reports for all pertinent standards.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Detention/Security windows shall be provided by a manufacturer and/or distributor of steel windows whose products meet the Steel Window Institute's performance specifications for detention/security windows, as set forth herein or in effect from time to time.

2.02 MATERIALS

A. Perimeter frames and imposts (where required) shall be manufactured from galvannealed steel not less than 12 gauge. Profiles shall conform to approved shop drawings.

B. Detention bars shall be 7/8" round and/or 1/4" x 2" flat steel bars. Moderate detention bars shall be mild steel and maximum detention bars are tool resisting steel.

C. Security tubes (where required) shall be 2" x 1- 1/2" not less than 14 gauge steel.

D. Glazing beads shall be steel angle not less than 14 gauge.

E. Bead and trim screws shall be tamper resisting #10 truss or button head plated steel.

F. Anchors shall be 3/16" plated steel angle or plate.

2.03 FABRICATION

A. Fabricate windows in accordance with the approved shop drawings.

B. Frame members shall be mitered and/or coped, face or back welded at the corners the full depth of the frame. Exposed face welds shall be dressed smooth.

C. Security tubes shall be solidly welded to the frame members.

D. Detention members shall be concealed in frame and tube members. Round detention bars shall penetrate the flat bars. All concealed detention bars shall be galvanized or iron-phosphate treated using a five-step process and prime painted.

E. Anchors shall be welded to the perimeter frame member or the 1/4" x 2" detention flat at a maximum spacing of 18" on center.

F. After assembly, windows shall be iron or zinc phosphate treated using a five-stage process and painted using acrylic polyurethane enamel or powder coated.

PART 3 EXECUTION

3.01 INSPECTION

A. Window openings shall conform to details and dimensions shown on the approved shop drawings.

B. Conditions which may adversely affect the window installation must be corrected by the General Contractor prior to installation.

3.02 INSTALLATION

A. Install windows in strict accordance with the approved shop drawings.

B. Set windows plumb, level and true to line, without warp or rack of frames.

C. All necessary manufacturer's standard steel anchors shall be included. Any required embedded or cast-in anchors shall be provided by the General Contractor in accordance with the window manufacturer's approved shop drawings.

D. Exterior metal-to-metal joints between windows, trim, and mullions shall be properly sealed watertight with an approved sealant by the window installer.

3.03 CLEANING

A. The General Contractor shall be responsible for protecting the windows and related materials during storage on the job and during and after installation.

B. Window installer shall leave the window surfaces clean after installation.

C. Any protection necessary due to the cleaning of materials adjacent to the windows shall be the responsibility of the General Contractor.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY:

A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
   1. Door hardware for steel (hollow metal) doors.
   2. Door hardware for aluminum doors.
   3. Door hardware for wood doors.
   4. Door hardware for other doors indicated.
   5. Keyed cylinders as indicated.

B. Related Sections:
   1. Division 6: Rough Carpentry.
   2. Division 8: Aluminum Doors and Frames
   3. Division 8: Hollow Metal Doors and Frames.
   4. Division 8: Wood Doors.

C. References: Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.
   1. Builders Hardware Manufacturing Association (BHMA)
   2. NFPA 101 Life Safety Code
   3. NFPA 80 -Fire Doors and Windows
   4. ANSI-A156.xx- Various Performance Standards for Finish Hardware
   5. UL10C – Positive Pressure Fire Test of Door Assemblies
   6. ANSI-A117.1 – Accessible and Usable Buildings and Facilities
   7. DHI /ANSI A115.IG – Installation Guide for Doors and Hardware
   8. ICC – International Building Code

D. Intent of Hardware Groups
   1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
   2. Where items of hardware aren't definitely or correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.

1.02 SUBSTITUTIONS:

A. Comply with Division 1.

1.03 SUBMITTALS:

A. Comply with Division 1.

B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.

C. Product Data: Manufacturer's specifications and technical data including the following:
1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.
3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
4. Submit 6 copies of catalog cuts with hardware schedule.
5. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.2

D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.
1. List groups and suffixes in proper sequence.
2. Completely describe door and list architectural door number.
3. Manufacturer, product name, and catalog number.
4. Function, type, and style.
5. Size and finish of each item.
6. Mounting heights.
7. Explanation of abbreviations and symbols used within schedule.
8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.

E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

F. Samples: (If requested by the Architect)
1. 1 sample of Lever and Rose/Escutcheon design, (pair).
2. 3 samples of metal finishes

G. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.
1. Operating and maintenance manuals: Submit 3 sets containing the following.
a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Name, address, and phone number of local representative for each manufacturer.
d. Parts list for each product.
2. Copy of final hardware schedule, edited to reflect, "As installed".
3. Copy of final keying schedule

4. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.04 QUALITY ASSURANCE

A. Comply with Division 1.
   1. Statement of qualification for distributor and installers.
   2. Statement of compliance with regulatory requirements and single source responsibility.
   3. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.
      a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
      b. Hardware Schedule shall be prepared and signed by an AHC.
   4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
   5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
      a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
      b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
   6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Comply with Division 1.
   1. Deliver products in original unopened packaging with legible manufacturer's identification.
   2. Package hardware to prevent damage during transit and storage.
   3. Mark hardware to correspond with "reviewed hardware schedule".
   4. Deliver hardware to door and frame manufacturer upon request.

B. Storage and Protection: Comply with manufacturer's recommendations.

1.06 PROJECT CONDITIONS:

A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.

B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.07 WARRANTY:

A. Refer to Conditions of the Contract

B. Manufacturer's Warranty:
1. Closers: Ten years
2. Exit Devices: Five Years
3. Locksets & Cylinders: Three years
4. All other Hardware: Two years.

1.08 OWNER'S INSTRUCTION:

A. Instruct Owner's personnel in operation and maintenance of hardware units.

1.09 MAINTENANCE:

A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.
1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.

B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1.

Item:	Manufacturer:	Approved:
Hinges	Stanley	Bommer, McKinney
Continuous Hinges	Stanley	Select, ABH
Locksets	Best 45H	Schlage L9000, Sargent 8200
Cylinders	Best Patented CoreMax	No Substitution
Exit Devices	Precision 2000	Von Duprin XP98, Sargent 8000-GL, 19, 43,
Closers	Stanley QDC100	LCN 4040 XP, Sargent 251
Access Control System	By Owner	

Push/Pull Plates	Trimco	Burns, Hiawatha
Protection Plates	Trimco	Burns, Hiawatha
Overhead Stops	Dorma	ABH, Trimco
Door Stops	Trimco	Burns, DCI
Flush Bolts	Trimco	ABH, Burns

2.02 MATERIALS:

A. Hinges:
1. Template screw hole locations
2. Minimum of 2 permanently lubricated non-detachable bearings
3. Equip with easily seated, non-rising pins
4. Sufficient size to allow 180-degree swing of door
5. Furnish hinges with five knuckles and concealed bearings
6. Provide hinge type as listed in schedule.
7. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
8. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
9. UL10C listed for Fire rated doors.

B. Geared Continuous Hinges:
1. Tested and approved by BHMA for ANSI A156.26-1996 Grade 1
2. Anti-spinning through fastener
3. UL10C listed for 3 hour Fire rating
4. Non-handed
5. Lifetime warranty
6. Provide Fire Pins for 3-hour fire ratings
7. Sufficient size to permit door to swing 180 degrees

C. Mortise Type Locks and Latches:
1. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and be UL10C.
2. Furnish UL or recognized independent laboratory certified mechanical operational testing to 4 million cycles minimum.
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Fit ANSI A115.1 door preparation
5. Functions and design as indicated in the hardware groups
6. Solid, one-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of self-lubricating stainless steel
7. Deadbolt functions shall have 1 inch (25mm) throw bolt made of hardened stainless steel
8. Latchbolt and Deadbolt are to extend into the case a minimum of 3/8 inch (9.5mm) when fully extended
9. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated
10. Provide sufficient curved strike lip to protect door trim
11. Lever handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable

12. Lock shall have self-aligning, thru-bolted trim
13. Levers to operate a roller bearing spindle hub mechanism
14. Mortise cylinders of lock shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal setscrew will be accessible only by removing the core, with the control key, from the cylinder body.
15. Spindle to be designed to prevent forced entry from attacking of lever
16. Provide locksets with 7-pin removable and interchangeable core cylinders
17. Each lever to have independent spring mechanism controlling it
18. Core face must be the same finish as the lockset.

D. Mortise Deadbolt:
1. Tested and approved by ANSI A156.36, Operational Grade 1.
2. Provide 9001-Quality Management and 14001-Environmental Management.
3. Locksets and cores to be of the same manufacturer to maintain complete lockset warranty
4. 2-3/4 inch (70mm) backset
5. 1 inch throw deadbolt
6. Provide locksets with 7-pin core.

E. Exit Devices shall:
1. Tested and approved by BHMA for ANSI 156.3, Grade 1
2. Provide 9001-Quality Management and 14001-Environmental Management.
3. Furnish UL or recognized independent laboratory certified mechanical operational testing to 10 million cycles minimum.
4. Provide a deadlocking latchbolt
5. Non-fire rated exit devices shall have cylinder dogging.
6. Touchpad shall be "T" style
7. Exposed components shall be of architectural metals and finishes.
8. Lever design shall match lockset lever design
9. Provide strikes as required by application.
10. Fire exit devices to be listed for UL10C
11. UL listed for Accident Hazard
12. Shall consist of a cross bar or push pad, the actuating portion of which extends across, shall not be less than one half the width of the door leaf.
13. Provide vandal resistant or breakaway trim

F. Cylinders:
1. Provide the necessary cylinder housings, collars, rings & springs as recommended by the manufacturer for proper installation.
2. Provide the proper cylinder cams or tail piece as required to operate all locksets and other keyed hardware items listed in the hardware sets.
3. Coordinate and provide as required for related sections.
4.

G. Door Closers shall:
1. Tested and approved by BHMA for ANSI 156.4, Grade 1
2. UL10C certified
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Closer shall have extra-duty arms and knuckles

5. Conform to ANSI 117.1
6. Maximum 2 7/16 inch case projection with non-ferrous cover
7. Separate adjusting valves for closing and latching speed, and backcheck
8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
9. Full rack and pinion type closer with 1½" minimum bore
10. Mount closers on non-public side of door, unless otherwise noted in specification
11. Closers shall be non-handed, non-sized and multi-sized.

H. Kickplates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

I. Mop plates: Provide with four beveled edges ANSI J103, 6 inches high by width less 1 inch on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

J. Door Bolts: Flush bolts for wood or metal doors.
1. Provide a set of Automatic bolts, Certified ANSI/BHMA 156.3 Type 25 for hollow metal label doors.
2. Provide a set of Automatic bolts, Certified ANSI/BHMA 156.3 Type 27 at wood label doors.
3. Manual flush bolts, Certified ANSI/BHMA 156.16 at openings where allowed local authority.
4. Provide Dust Proof Strike, Certified ANSI/BHMA 156.16 at doors with flush bolts without thresholds.

K. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.

2.03 FINISH:

A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products

B. Powder coat door closers to match other hardware, unless otherwise noted.

C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.04 KEYS AND KEYING:

A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.

B. Cylinders, removable and interchangeable core system: Best CORMAX™ Patented 7-pin.

C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."

D. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.

E. Furnish keys in the following quantities:
1. 1 each Grand Masterkeys
2. 4 each Masterkeys
3. 2 each Change keys each keyed core
4. 15 each Construction masterkeys
5. 1 each Control keys

F. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.

G. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 HARDWARE LOCATIONS:

A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
1. Recommended Locations for Builder’s Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

3.03 INSTALLATION:

A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

B. Conform to local governing agency security ordinance.

C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
   1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.

D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.

3.04 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.
   1. Check and adjust closers to ensure proper operation.
   2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
      a. Verify levers are free from binding.
      b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.
   3. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.05 SCHEDULE OF FINISH HARDWARE:

Manufacturer List

Code	Name
BE	Best Access Systems
DM	Dorma Door Controls
PR	Precision
SH	Stanley Commercial Hardware
ST	Stanley
TR	Trimco

Option List

Code	Description
CD	CYLINDER DOGGING
RP	RINGS-RIM CYLINDER
36"	36" Door Width
CSK	COUNTER SINKING OF KICK and MOP PLATES
CA-03	Cylinder Attachment Kit (Rim/SVR Device)
1-3/4"	1-3/4" Thick Doors
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES
Cut to Length	Cut to Length (Specify)
CORMAX PATENTED KEYING	Cormax Patented Keying

Finish List

Code	Description
AL	Aluminum
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
GREY	Grey
US26D	Chromium Plated, Dull
US32D	Stainless Steel, Dull

Hardware Sets

SET #1
Doors: 110

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Lockset	45H-7AB15R PATD CORMAX PATENTED KEYING	626	BE
1	Door Closer	QDC115	689	SH
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Mop Plate	KM050 6" x 35" B4E-HEAVY-KP CSK	630	TR

1	Wall Bumper	1270CX	626	TR
3	Silencer	1229A	GREY	TR

SET #2
Doors: 102, 103

3	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
1	Lockset	45H-7AB15R PATD CORMAX PATENTED KEYING	626	BE
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Mop Plate	KM050 6" x 35" B4E-HEAVY-KP CSK	630	TR
1	Wall Bumper	1270CX	626	TR
3	Silencer	1229A	GREY	TR

SET #3
Doors: 111

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Lockset	45H-7AB15R PATD CORMAX PATENTED KEYING	626	BE
1	Door Closer	QDC120	689	SH
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Mop Plate	KM050 6" x 35" B4E-HEAVY-KP CSK	630	TR
3	Silencer	1229A	GREY	TR

SET #4
Doors: 117, 118, 119, 120, 121, 124

3	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
1	Lockset	45H-7D15R PATD CORMAX PATENTED KEYING	626	BE
1	Overhead Stop	902S	626	DM
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Mop Plate	KM050 6" x 35" B4E-HEAVY-KP CSK	630	TR
3	Silencer	1229A	GREY	TR

SET #5
Doors: 105

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Lockset	45H-7AB15R PATD CORMAX PATENTED KEYING	626	BE
1	Door Closer	QDC115	689	SH
1	Mop Plate	KM050 6" x 35" B4E-HEAVY-KP CSK	630	TR
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Wall Bumper	1270CX	626	TR
1	Smoke Seal	5075CL	CLEAR	NA

SET #6
Doors: 104

1	Continuous Hinge	662HD UL 83" Cut to Length NOTE: Cut for 1 leaf for Dutch Door	AL	ST
1	Semi-Auto Flushbolt	3820	630	TR
1	Deadlock	48H-7K PATD CORMAX PATENTED KEYING	626	BE
1	Lockset	45H-7D15R PATD CORMAX PATENTED KEYING	626	BE
1	Door Close	QDC119	689	SH
2	Magnetic Holder	EM504	689	DM
1	Mop Plate	KM050 6" x 35" B4E-HEAVY-KP CSK	630	TR
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Floor Stop/Holder	1283-2S	626	TR
1	Smoke Seal	5075 CL @ Head, Jambs & Astragal NOTE: Dutch shelf projects to pull side of door.	CLEAR	TR

SET #7
Doors: 101

3	Hinges	CB191 4 1/2 X 4 ½ NRP	US26D	ST
1	Lockset	45H-7D15R PATD CORMAX PATENTED KEYING	626	BE
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Wall Bumper	1270CX	626	TR
3	Silencer	1229A	GREY	TR

SET #8
Doors: 125

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Exit Device	2108 X 4908A 1-3/4" 36" CA-03 CD	630	PR
1	Rim Cylinder	12E-72 PATD CORMAX PATENTED KEYING RP	626	BE
1	Door closer	QDC117	689	SH
1	Mop Plate	KM050 6" x 35" B4E-HEAVY-KP CSK	630	TR
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
3	Silencer	1229A	GREY	TR

SET #9
Doors: 106, 107, 108, 109, 112, 114, 115, 116, 122, 123

1	REH	REUSE EXISTING HARDWARE	TECT

SET #10
Doors: 113, 125

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Lockset	45H-7D15R PATD CORMAX PAT. KEYING	626	BE
1	Door closer	QDC117	689	SH
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Mop Plate	KM050 6" x 35" B4E-HEAVY-KP CSK	630	TR
1	Smoke Seal	5075CL	CLEAR	NA

Opening List

Opening	Hdw Set	Opening Label
101	7	
102	2	
103	2	
104	6	
105	5	
106	9	
107	9	
108	9	
109	9	
110	1	
111	3	
112	9	
113	10	
114	9	
115	9	
116	9	
117	10	
118	4	
119	4	
120	4	
121	4	
122	9	
123	9	
124	4	
125	8	

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Glass products.
   2. Glazing sealants.
   3. Glazing tapes.
   4. Miscellaneous glazing materials.

1.02 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

C. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

A. Product Certificates: For glass.

B. Product test reports.

C. Preconstruction adhesion and compatibility test report.

D. Sample warranties.

1.06 QUALITY ASSURANCE

A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
   1. Design Wind Pressures: 5 psf.
   2. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.

B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

2.02 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated 3/8th.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.03 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

C. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.04 GLAZING SEALANTS

A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: Match Architect's samples.

B. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.

C. Neutral-Curing Silicone Glazing Sealant, Class 50: Complying with ASTM C920, Type S, Grade NS, Use NT.

2.05 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.06 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks:
1. Silicone with Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended in writing by sealant or glass manufacturer.

C. Spacers:
1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended in writing by sealant or glass manufacturer.

D. Edge Blocks:
   1. EPDM with Shore A durometer hardness per manufacturer's written instructions.
   2. Type recommended in writing by sealant or glass manufacturer.

PART 3 EXECUTION

3.01 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

3.02 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Apply heel bead of elastomeric sealant.

F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of

removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.03 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.04 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.05 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

3.06 MONOLITHIC GLASS SCHEDULE

A. Clear Glass Type: float glass.
1. Minimum Thickness: 9 mm.
2. Safety glazing required.
3. Basis-of-Design Product:
   a. Consolidated Glass.
   b. Lexguard MPC 375.
4. Minimum Thickness: 9 mm.
5. Safety glazing required.

END OF SECTION

SECTION 08 88 53

DETENTION AND SECURITY GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing for detention windows, type as indicated.

1.02 RELATED SECTIONS

A. Division 8 Section – "Detention / Security Windows": Section 08 66 00.

1.03 REFERENCES

A. American National Standards Institute (ANSI)
   1. ANSI Z97.1-09 – American National Standard for Safety Glazing Material used in Buildings. (Previous versions not acceptable)

B. American Society for Testing and Materials (ASTM)
   1. ASTM E773 – Test Method for seal Durability of Sealed Insulating Glass Units.
   2. ASTM E838 – Cracking, Blistering, Crazing and Color Changes.
   3. ASTM C1349 – 04 Standard Specification for Architectural Flat Glass Clad Polycarbonate
   4. ASTM F1915-05 – Standard Specification for Test Methods for the Glazing of Detention Facilities. (Previous versions not acceptable).

C. Consumer Product Safety Commission (CPSC)
   1. CPSC 16CFR 1201 – Safety Standards for Glazing Materials

D. Underwriter's Laboratories
   1. UL – 752 Bullet Resisting Equipment

E. Federal Specifications (FS)
   1. FS TT-S230A – Sealing Compound, synthetic rubber base, single component, chemically curing for caulking, sealing and glazing in building construction.
   2. FS TT-S-0023003 – Sealing compound, Elastomeric type, single component (for caulking, sealing, and glazing in buildings and other structures).
   3. CID A-A-59502 – Plastic Sheet, Polycarbonate

F. Flat Glass Marketing Association (FGMA)
   1. FGMA – Glazing Manual
   2. FGMA – Sealant Manual

1.04 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 specifications Sections.

B. Product Data: Submit Manufacturer's descriptive literature and technical data including:

1. Instructions for handling, storing, installation, and recommended procedures for cleaning of each type of glass and glazing material.
2. Provide structural, physical and environmental characteristics and size limitations of each type of glazing material.
3. Provide chemical, functional, environmental characteristics, limitations and special application requirements.
4. Color: Clear.

C. Samples: Submit in accordance to division 1, prior to delivery of materials, samples of each of the following:
1. Minimum, one 12 inch x 12 inch piece of each type of glazing, in required thickness.
2. One bead, approximately ¼" wide by 3 inch long, of each sealant to be used, indicating color or cured materials.

D. Certification by manufacturer that products supplied comply with performance requirements specified.

E. Maintenance data covering cleaning and protection requirements.

F. Security Glazing Substitutions: All requests and submittal for approval as security glazing must be made to the architect 14 days prior to original bid date.

1.05 QUALITY ASSURANCE

A. Manufacturer qualifications: Company specializing in the manufacture of Security Glazing, types as specified, with minimum documented (5) years' experience.

B. Installer qualifications: Company specializing in the installation of Security Glazing products, similar types as specified, with minimum documented (5) year experience.

C. Security Glazing Forced Entry Tests- Glazing manufacture must provide current test reports showing products are tested to specified security grade, test must be conducted at an industry accepted laboratory having at least a minimum of 10 years of testing security glazing.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery
1. Deliver all glazing with manufacturer's, and removable product labels intact.
2. Provide product labels for each type of glass indicating:
   a. Manufacturer's name and product number.
   b. Mark number in accordance with the drawings.
   c. Size and thickness of the glazing.
3. Deliver glazing components and sealants in manufacturer's unopened, labeled container.

B. Storage and Handling
1. Store glazing in designated area, away from traffic and construction, in original packaging.

2. Support glazing vertically on setting material capable of holding the glazing and distributing the weight evenly over the glazing unit.
3. Do not remove levels until glazing has been installed.
4. Storage conditions shall protect glazing materials from:
    a. U-V exposure, humidity, rain, and adverse temperatures.
    b. Scratching, marring, chipping and warpage.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Perform glazing only when ambient temperature is above 50 degrees F.

B. When circumstances require glazing below 50 degrees F, steps shall be taken to assure dry and frost-free surface, as approved by the architect.

1.08 WARRANTY

A. Provide manufacturer's written warranty for a period of not less than (7) years from date of shipment, for Monolithic and Laminated Polycarbonate against coating failure and delamination.

B. Provide a written warranty executed by manufacturer, agreeing to furnish F.O.B project site, within 60 working days after receipt of notice from owner for replacement of units which develop manufacturing defects. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contract under requirements of the Contract Documents.

C. Definitions: Manufacturing defects defined as delamination, coating failure and/or yellowing not related to improper handling or use of the glazing material as defined in Manufacturer's installation guide and care and maintenance instructions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Security Type Glazing Manufactures:
    1. Palram Americas, Inc, Kutztown, PA – 800-999-9459

B. Glazing Materials:
    1. Tremco, Cleveland, OH or equal as approved by Architect

2.02 FLAT MONOLITHIC AND LAMINATED POLYCARBONATE COMPOSITIONS "SECURITY" TYPES

A. General: All laminated composition security glazing units, whether specifically shown or specified, shall conform to manufacturer's standards as to maximum size for each type of glass.

B. Forced-Entry Resistant Performance: Provide products identical to those tested for compliance with requirements indicated per test specified for specific glazing types. All

polycarbonate products in this section shall have a mar resistant coating on all exposed surfaces. 7 year coating warranty.

1. TYPE MP-1 – Monolithic Polycarbonate with abrasion resistant coating. Product Type Palram Americas Product Name - Palgard. 3/8" Nominal Thickness. ASTM F1915-05 Security Grade 4. ANSI Z97.1-09 – Approved for Exterior Use

2.03 DESCRIPTION / FABRICATION

A. Interlayer: provide glazing manufacturer's standard interlayer for laminating a polycarbonate core, with a proven record of showing no tendency to bubble, discolor or loose physical or mechanical properties after laminating and installation,

B. Plastic core: Refer to appropriate product requirements relating to properties of polycarbonate making up the laminated compositional security product.

C. Laminating Process: Fabricated laminated sheets using laminator's standard process to produce units free from foreign substances and air bubbles.

2.04 GLAZING MATERIALS

A. Compatibility: Select material with proven record of compatibility with surfaces contacted in each application.

B. Sealant: Shall be single component elastomeric silicone which complies with FSTT-S-001543, Class A, nonsag, ASTM C-920 Type S, Grade NS Class 25. Use G for high modulus silicone. Dow Corning 795 ,GE Silpruf SC2000 or Tremco ProGlaze SSG as determined acceptable by the Architect.

C. Glazing Tape: Shall be 1/8" x 1/2" performed butyl tape, 100% solids, Tremco 440 or approved equal. Shimmed or unshimmed as needed.

D. Setting Blocks: Blocking shall be comprised of EPDM or Santoprene 101-87 as tested to be compatible with the specified security glazing product and glazing sealants, 70-90 Shore A durometer hardness, 4 inch long x 3/8 inch wide x ¼ inch thick.

E. Spacers: Shall be comprised of EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealants; 40-50 Shore A durometer hardness; of size and shape recommended by glazing and sealant Mfg.

F. Edge Blocks: Shall be comprised of EPDM or Santoprene 101-87 as tested to be compatible with the specified security glazing product and glazing sealants, 70-90 Shore A durometer hardness, 1/8" thick.

G. Cleaners, Primers, and Sealants: Type recommended by sealant or gasket Mfg. For each application.

PART 3 EXECUTION

3.01 INSPECTION

A. Check that glazing channels are free from burrs, irregularities, and debris.

B. Check that glazing is free from edge damage or face imperfections.

C. Do not proceed with installation until any unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Field Measurements:
1. Cut glazing accurately to size obtained from verified field measurements of frames.
2. Allow for proper edge clearances.

B. Preparation of surfaces:
1. Remove any protective coatings or coverings from surface to be glazed.
2. Clean glazing surfaces to remove dust, oil, and contaminants with compatible cleaner. Then wipe dry.

3.03 INSTALLATION

A. General Requirements: All materials shall be used in accordance with the manufacturer's printed instructions and recommended procedures, as published by Glass Association of North America.

B. Clearance requirements: Allow the following minimum nominal clearances, in accordance with glazing manufacturer's recommendations; glazing face to channel face, glazing edge to frame member, and glazing bite.

Glazing thickness	Face clearance	Edge clearance	Bite
Specified thickness	1/8 inch	1/4 inch	1 inch

3.04 INTERIOR DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and install against permanent stop, shall then be filled to the sight line.

B. Place setting blocks at ¼ points.

C. Rest glazing on setting blocks and press against tape with sufficient pressure to ensure full contact and adhesion at perimeter.

D. Place glazing tape on free perimeter of glazing in same manner described above.

E. Install removable stop, avoid displacement of tape, exert pressure on tape for full continuous contact.

3.05 CLEANING AND PROTECTION

A. Cleaning
1. Remove excess glazing material from installed glazing.
2. Remove labels from surface as soon as installed.
3. Remove debris from work site.

B. Protection

1. Attach crossed streamers away from glazing face.
2. Do not apply markers to glazing surface.
3. Replace damaged glazing.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
   2. Suspension systems for interior gypsum ceilings and soffits.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

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

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.02 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
   2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized.

B. Studs and Runners: ASTM C 645.
   1. Steel Studs and Runners:
      a. Minimum Base-Metal Thickness: 0.018 inch unless otherwise indicated.
      b. Depth: As indicated on Drawings.

C. Cold-Rolled Channels: Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: 3/4 inch.

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

D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.018 inch unless otherwise indicated.
   2. Depth: 7/8 inch.

E. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.03 SUSPENSION SYSTEMS

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

B. Hanger Attachments to Concrete:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
      a. Type: Postinstalled, expansion anchor.
   2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

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

D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch-wide flanges.
   1. Depth: 1-1/2 inches unless otherwise indicated.

F. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
   2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
      a. Minimum Base-Metal Thickness: 0.018 inch.
   3. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
      a. Configuration: Asymmetrical.

2.04 AUXILIARY MATERIALS

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

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

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.03 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

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

C. Install bracing at terminations in assemblies.

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

3.04 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
   2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
   3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

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

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

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
      c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
      a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance- rated assembly indicated.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
   6. Curved Partitions:
      a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
      b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:
   1. Screw to wood framing.
   2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Furring Members:
   1. Erect insulation, specified in Section 07 21 00 "Building Insulation," vertically and hold in place with Z-furring members spaced 24 inches o.c.
   2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
   3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of

furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

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

3.05 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Hangers: 48 inches o.c.
   2. Carrying Channels (Main Runners): 48 inches o.c.
   3. Furring Channels (Furring Members}: 16 inches o.c.

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

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   5. Do not attach hangers to steel roof deck.
   6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

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

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

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Texture finishes.

B. Related Requirements:
   1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
   2. Textured Finishes: Minimum 2 feet by 2 feet for each textured finish indicated and on same backing indicated for Work.

1.04 DELIVERY, STORAGE AND HANDLING

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

1.05 FIELD CONDITIONS

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

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

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

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

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

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

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.02 GYPSUM BOARD, GENERAL

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

2.03 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. American Gypsum.
2. CertainTeed Corporation.
3. Georgia-Pacific Building Products.
4. National Gypsum Company.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.
1. Type X where indicated or required for fire-resistance-rated assemblies.
2. Thickness: 5/8 inch unless otherwise indicated.
3. Long Edges: Tapered.

C. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
1. Thickness: 1/4 inch.
2. Long Edges: Tapered.

D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces. Install in all "wet" areas, including ceilings; behind tile finishes except at showers. Refer to Division 9 Section "Tiling" for shower backing panels.
1. Type X where indicated or required for fire-resistance-rated assemblies.
2. Thickness: 5/8 inch unless otherwise indicated.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.04 TRIM ACCESSORI ES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
   2. Shapes:
      a. Cornerbead.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound.
      c. L-Bead: L-shaped; exposed long flange receives joint compound.
      d. Expansion (control) joint.
      e. Curved-Edge Cornerbead: With notched or flexible flanges.

2.05 JOINT TREATMENT MATERIALS

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

B. Joint Tape:
   1. Interior Gypsum Board: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.
   5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

2.06 AUXILIARY MATERIALS

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

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Pecora Corporation.
      b. Specified Technologies, Inc.

2.07 TEXTURE FINISHES

A. Finish: Water-based, job-mixed, drying-type texture finish and synthetic sand for spray application.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed Corporation.
      b. National Gypsum Company.
   2. Texture: Light stipple texture according to sample approved by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

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

3.02 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

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

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

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

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

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

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

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

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound- flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

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

3.03 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Wallboard Type: Vertical surfaces unless otherwise indicated.
   2. Type X: Where required for fire-resistance-rated assembly.
   3. Flexible Type: Apply in double layer at curved assemblies.
   4. Moisture- and Mold-Resistant Type: As indicated on Drawings and behind tile finishes.
   5. Type C: Where required for specific fire-resistance-rated assembly indicated.

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
   4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:
   1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
   2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.04 INSTALLING TRIM ACCESSORIES

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

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

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use only where indicated.
   2. LC-Bead: Use at exposed panel edges.
   3. L-Bead: Use where indicated.

3.05 FINISHING GYPSUM BOARD

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

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

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

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated. Embed tape in joint compound.
   2. Level 2: Panels that are substrate for tile and where indicated. Embed tape in joint compound and apply first coat of joint compound.
   3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated. Embed tape in joint compound and apply first, fill (second) and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
   4. Level 5: Where indicated on Drawings and as a substrate for dry-erase wallcoverings. Finish per level 4, then apply skim coat of joint compound to wall as needed to provide smooth surface free of visual defects.

3.06 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.07 PROTECTION

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

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

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

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes:
   1. Acoustical ceiling panels.
   2. Exposed ceiling suspension systems.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.04 DELIVERY, STORAGE, AND HANDLING

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

B. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.05 PROJECT CONDITIONS

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

1.06 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including

light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.07 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Ceiling Tile: Furnish quantity of full-size units equal to a minimum of one full box each for each type, composition, color, pattern, and size indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, acoustical panels that may be incorporated in the Work include, but are not limited to, the following:
   1. Ceramic and Mineral Fiber Composite Panels:
      a. Ceramaguard #605; Armstrong World Industries.

2.02 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.03 ACOUSTICAL PANEL REQUIREMENTS

A. Panel Characteristics: Type XX, Pattern G for acoustical panels per ASTM E 1264, Fire Class A, with painted finish, complying with requirements indicated below:
   1. Color/Light Reflectance Coefficient: White/LR 0.88
   2. Edge Detail: Square
   3. Thickness: 5/8 inch
   4. Size: 24 by 48 inches.

B. Suspension System Type: As described below and specified in Part 2 "Non-Fire-Resistance-Rated, Direct-Hung Suspension Systems" Article:
   1. Wide-face, single-web, steel suspension system.

2.04 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard hot-dip galvanized metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
   2. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire, but provide not less than 0.106-inch-diameter wire.

D. Sheet-Metal Edge Moldings and Trim: Type and profile indicated, or if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
   1. Provide extruded aluminum edge moldings at exterior locations, painted white finish.

2.05 NON-FIRE-RESISTANCE-RATED, DIRECT-HUNG SUSPENSION SYSTEMS

A. Wide-Face, Single-Web, Capped, Hot Dip Galvanized, Steel Suspension System: Main and cross runners roll formed from prepainted or electrolytic zinc-coated, cold-rolled steel sheet, with prepainted 15/16-inch-wide flanges; other characteristics as follows:
   1. Structural Classification: Intermediate-duty system.
   2. Finish: Painted white.
   3. Provide hold-down clips to keep panels in place.

B. Available Manufacturers: Subject to compliance with requirements, manufacturer's suspension systems that may be incorporated in the Work include, but are not limited to, the following:
   1. Armstrong World Industries.
   2. Chicago Metallic Corporation.
   3. USG Interiors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

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

3.03 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
   1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
   2. CISCA Recommendations for Acoustical Ceilings: Comply with CISCA "Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Screw attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

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

E. Provide additional bracing of suspension system at exterior locations to resist wind load.

F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. Install panels with pattern running in one direction parallel to long axis of space.
   2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
4. Install hold-down clips; space as recommended by panel manufacturer's written instructions unless otherwise indicated.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

A. RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Resilient base.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

1.04 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.01 THERMOSET-RUBBER BASE

1. Manufacturers: Subject to compliance with requirements, use the following or approved equal.
2. Tarkett North America.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous). Provide manufacturer's standard cove with top-set toe, 48" cut lengths, 1/8" thick, with job formed exterior and interior corners. 4" height or as indicated.

2.02 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.03 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible.

3.04 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum horizontal surfaces thoroughly.
   3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes vinyl composition floor tile.

B. Resilient wall base, reducer strips, and other accessories installed with resilient floor tiles are specified in Division 9 Section "Resilient Wall Base and Accessories."

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified and samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile indicated.

C. Maintenance data for resilient floor tile, to be included in Operating and Maintenance Manual specified in Division 1.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility for Floor Tile: Obtain each type, color, and pattern of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Store tiles on flat surfaces. Move tiles and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.06 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).

B. Do not install tiles until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during tile installation.

1.07 SEQUENCING AND SCHEDULING

A. Install tiles and accessories after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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

2.02 RESILIENT TILE

A. Vinyl Composition Floor Tile:Products complying with ASTM F 1066, Composition 1 (nonasbestos formulated), 12" x 12" x 1/8" thick, Class 2, smooth surface.

2.03 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

B. Trowelable Underlayment and Patching Compounds: Latex-modified, Portland cement based formulation provided or approved by tile manufacturer for applications indicated.

C. Adhesives (Cements): Water-resistant Low-VOC type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. General: Examine areas where installation of tiles will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with tile manufacturer's requirements and those specified in this Section.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
   2. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

4. Underlayment surface is free of surface irregularities and substances with potential to interfere with adhesive bond, show through surface, or stain tile.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive tile.

B. Use trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

D. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.03 INSTALLATION

A. General: Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.

B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, pipes, outlets, edgings, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.

G. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.

H. Hand roll tiles where required by tile manufacturer.

3.04 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing tile installation:
   1. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturers.
   2. Sweep or vacuum floor thoroughly.
   3. Do not wash floor until after time period recommended by resilient floor tile manufacturer.
   4. Damp-mop tile to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.
   1. Apply protective floor polish to floor surfaces that are free from soil, visible adhesive, and surface blemishes, if recommended in writing by manufacturer.
      a. Use commercially available product acceptable to flooring manufacturer.
      b. Coordinate selection of floor polish with Owner's maintenance service.
   2. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Substantial Completion.
   3. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

C. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.
   1. Before cleaning, strip protective floor polish that was applied after completing installation only if required to restore polish finish and if recommended by flooring manufacturer.
   2. After cleaning, reapply polish to floor surfaces to restore protective floor finish according to flooring manufacturer's written recommendations. Coordinate with Owner's maintenance program.

END OF SECTION

SECTION 09 67 23

RESINOUS FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This section includes the following:
   1. Seamless, acrylic, methyl methacrylate (MMA) flooring system as shown on drawings and schedules.

1.03 SYSTEM DESCRIPTION

A. The work shall consist of preparation of the substrate, the furnishing and application of a methyl methacrylate (MMA) based self-leveling seamless flooring system with decorative flake broadcast and topcoats. The system shall have the color and texture as specified by the Owner with a nominal thickness of 3/16 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

B. Cove base (if required) to be applied where noted on plans and per manufacturers standard details unless otherwise noted.

1.04 SUBMITTALS

A. Product data sheets for each type of product indicated including tech data, application instructions, and recommendations for each component required.

B. A minimum of 4" square sample of the specified flooring system.
   1. The installed flooring system shall be like the accepted sample in thicknesses of respective film layers, color, texture, overall appearance and finish.

C. The manufacturer's safety data sheets for the components being installed (SDS).

1.05 QUALITY ASSURANCE

A. No request for substitution shall be considered that would change the generic type of floor system specified. Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 5 days prior to bid date. Request will be subject to specification requirements described in this section.

B. Pre-qualification requirements: Each bidder for this project shall be prequalified and approved by the material manufacturer at the time of bid submittal. Acceptability will

include judgement on equipment, history, and financial strength. In no case will Res-Tek Inc. allow the application of any of its materials by untrained, non-approved Contractors or personnel.

1. Each approved applicator shall have been trained by the Manufacturer in all phases of surface preparation and application of the specified flooring system.
2. Each approved applicator must have five years of experience installing the specified flooring system and submit a list of five projects/references as a prequalification requirement of equal size, quantity, and magnitude to this project as a prequalification requirement. Owner has the option to personally inspect the projects/references to accept or reject any of the Contractors prior to bid time as a prequalification requirement.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section.

D. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

E. Surface preparation efforts shall be evaluated by conducting Bond Tests at the site prior to application of the flooring system, consult with Material Manufacturer for specific procedure.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store material per product data sheet.

1.07 PROJECT/SITE CONDITIONS

A. Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

D. Conditions required of new concrete to be coated with MMA materials.

1. Concrete shall be moisture cured for a minimum of 7 days at 70° F. The concrete must be fully cured for a minimum of 28 days prior to application of the coating system.

2. Surface contaminants such as curing agents, membranes, or other bond breakers should not be used.
3. Concrete shall have a rubbed, float, or darby finish. A hard steel trowel is neither necessary nor desirable.
4. Drains should be set to the concrete grade rather than raised to the finished grade of the topping.

E. If any of the above conditions are not met, consult with your Res-Tek sales representative.

1.08 WARRANTY

A. Res-Tek Inc. warrants that materials shipped to buyers are at the time of shipment substantially free from material defects and will perform substantially according to Res-Tek's published literature if used strictly in accordance with Res-Tek's prescribed procedures and prior to expiration date. For more details please request a copy of a sample warranty statement.

PART 2 PRODUCTS

2.01 RESINOUS FLOORING

A. Acceptable Manufacturer:
1. Subject to compliance with requirements, use the following or approved equal.
2. Res-Tek Inc. 110 Riverside Drive Cartersville, Georgia 30120, PH: (770) 427-4034, (888) 737-8351, FAX: (770) 427-4037.

B. Products: MAC-Guard Self-Leveling Acrylic Flake System, Basis of Design.

C. Characteristics:
1. Color and pattern selected from the manufacturer's standards.
2. Wearing surface: standard.
3. Integral cove base: TBD.
4. Overall system thickness 3/16".

D. Components
1. Primer:
   a. Material basis: MAC-710 Primer.
   b. Resin type: Methyl Methacrylate.
   c. Formulation description: (2) component, low viscosity.
   d. Application method: roller applied.
   e. Number of coats: (1) one.
2. Body Coat:
   a. Material Basis: MAC-800 Overlay Resin.
   b. Resin type: Methyl Methacrylate.
   c. Formulation description: (2) component, medium viscosity.
   d. Application method: Gauge rake.
      (i) I. Thickness: 1/8".
      (ii) II. Number of coats: (1) One.
3. 3. Broadcast:

a. a. Material basis: Res-Tek Colored Flakes.
b. b. Formulation description: Decorative flake (1/16” or 1/4” size flake).
c. c. Color: Selected by owner.
d. d. Finish: Broadcast to rejection.

4. 4. Topcoat:
   a. a. Material basis: MAC-925 Topcoat.
   b. b. Resin type: Methyl Methacrylate.
   c. c. Formulation description: (2) component, low viscosity, UV stable.
   d. d. Type: Clear.
   e. e. Number of coats: (2) two.

2.02 ACCESSORY MATERIALS

A. Patching, leveling, and fill materials: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

B. Joint sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

2.03 SYSTEM CHARACTERISTICS

A. Percent solid: 100%.

B. Tensile strength: 3,850 psi per ASTM D638.

C. Tensile modulus: 470,000 psi per ASTM D638.

D. Hardness: 0.85 per ASTM D2240.

E. Compressive strength: 8,000 psi per ASTM C109.

F. Linear Coefficient of Thermal Expansion: 3.5 x 10^-5 in./in.℉ per ASTM D696).

G. Water Vapor Transmission (DIN 53122): 1.43 g/cm-hr-mm HG x 10^-9.

PART 3 EXECUTION

3.01 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean and dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. All accessible concrete deck surfaces shall be mechanically blast cleaned using a mobile steel shot, dust recycling machine such as BLASTRAC®, as manufactured by BLASTRAC, NA, or approved equivalent. All surface and embedded accumulations of paint, toppings, hardened concrete layers, laitance, power trowel finishes, and other similar surface characteristics shall be completely removed

leaving a bare concrete surface having a profile of CSP 4 or higher according to the Concrete Repair Institute's Concrete Surface Profile Scale and exposing the upper fascia of concrete aggregate.

2. Areas inaccessible to the mobile blast cleaning machines shall be mechanically abraded to the same degree of cleanliness, soundness, and profile using vertical disc scarifiers, scarifiers, needle guns, scabblers, or other suitably effective equipment.

C. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

D. Verify that concrete substrates meet the following requirements
1. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
2. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 5 lb of water/1000 sq. ft. of slab in 24 hours.
3. If these conditions cannot be met, discuss additional recommendations with your Res-Tek sales representative.

E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.02 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
    a. Apply joint sealant to comply with manufacturer's written recommendations

B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates.

C. Integral cove base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners. Refer to detail drawings.

D. Body coat: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed substrate using manufacturer's installation tool. Roll material with strict adherence to manufacturer's installation procedures and coverage rates.

E. Broadcast: Immediately broadcast decorative flakes into the body coat. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

F. First topcoat: Remove excess un-bonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.

G. Second topcoat: Thoroughly sand first sealer coat. Mix and apply second sealer coat with strict adherence to manufacturer's installation procedures.

3.03 TERMINATIONS

A. Chase edges to anchor the system into the substrate along the lines of termination.

B. Trenches: Continue coating system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

C. Treat floor drains by chasing the coating to lock in place at point of termination.

3.04 JOINTS AND CRACKS

A. Treat control joints to maintain a monolithic system.

B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Vertical and horizontal contraction and expansion joints are treated by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.05 FIELD QUALITY CONTROL

A. On site test and inspections performed by the approved applicator.
   1. Air, substrate temperatures and, if applicable, dew point.
   2. Bond test of the primer to the substrate.
   3. Rate for all layers to be monitored by checking quantity of material used against the area covered.

3.06 CURING, CLEANING, AND PROTECTING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer. General Contractor is responsible for cleaning prior to inspection

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Division 01 Specification Sections

1.02 SUMMARY

A. This section relates to carpet tile.

1.03 PREINSTALLATION MEETINGS

A. Conducted at (insert time, location and key contact).

1.04 SUBMITTALS

A. Product Specification
1. Specification for Adhesive
2. Shop Drawings
3. Samples
4. Schedule
5. Qualifications for Installer

B. CLOSEOUT SUBMITTALS
1. Maintenance Instructions
2. Warranty Documents

C. QUALITY ASSURANCE
1. Environmental:
   a. Green Label Plus Certified
   b. Cradle to Cradle Certified Gold
   c. NSF 140 Gold
   d. Health Product Declaration
   e. Declare Label, red list compliant
   f. No PVC components
   g. Installer Qualifications: Installer who has been trained in the installation of carpet tile.
2. Manufacturer Qualifications
   a. ISO 1400l
   b. ISO 9001
3. Reclamation Program: Will recycle EcoWorx carpet tile free of charge for quantities of 500 SY (418 SM) or more within continental United States and Canada or 5000 SY (4180 SM) globally.
   (i) Mockups at designated location for architect review and approval.

1.05 MATERIAL STORAGE AND HANDLING

A. Store rolls on a flat surface, away from vents and direct sunlight.

B. Store in protected dry conditions between 65 and 85 degrees.

1.06 SITE CONDITIONS

A. The following conditions must be maintained for 24 hours prior to, during and permanently after installation:
   1. HVAC System must be operational.
   2. The installation site, carpet and adhesive must be between 50°F and 95°F.
   3. The installation site's ambient relative humidity must not fall below 40%.
   4. Conduct relative humidity or Anhydrous Calcium Chloride testing. Results must be within the proper range for Shaw 5000 adhesive:
      a. Calcium Chloride ASTM F-1869 5.0 lbs per 1000 SF /24 hours
      b. Relative Humidity ASTM F-2170 85%
      c. EcoLogix ES does not require moisture or pH testing.
   5. Conduct pH testing on the floor in several locations. A reading below 5.0 or above 9.0 requires corrective measures.

PART 2 PRODUCTS

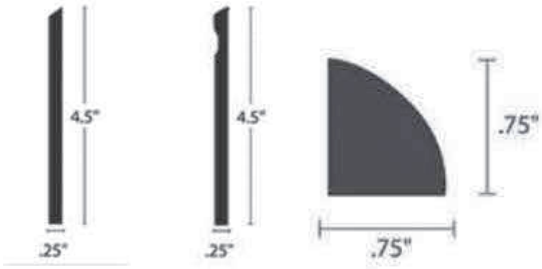
2.01 TESTING REQUIREMENTS

A. Pill Test CPSC FF 1 70: Pass
   1. Radiant Panel ASTM E648: Class I
   2. NBS smoke ASTM E662 NF: <450
   3. Static AATCC 134: <3.5 kv
   4. Coefficient of Friction: 0.6 (Meets ADA requirements)

B. TILE CARPETING
   1. Manufacturer: Patcraft
      a. Product: Homeroom v. 3.0
      b. Construction: Level Loop
      c. Fiber: Solution Q Extreme Nylon
      d. Dye Method: 100% Solution Dyed
      e. Backing: EcoWorx® Tile
      f. Protective Treatment: SSP® Shaw Soil Protection
      g. Size: 24" x 24"
      h. Gauge: 1/8
      i. Stitches: Per inch 7.8
      j. Finished Pile Thickness: .156
      k. Average Density: 7402
      l. Total Thickness: 0.230
      m. Tufted Weight: 22.0 oz

C. INSTALLATION MATERIALS
   1. Adhesives:
      a. For EcoWorx (fiberglass reinforced):
         (i) Shaw 5000 pressure sensitive: 5 lbs. 85% RH pH 5-9
         (ii) Shaw 5100 pressure sensitive: 5 lbs. 85% RH pH 5-9
         (iii) Shaw 5036 with antimicrobial: 5 lbs. 85% RH pH 5-9
         (iv) Shaw 5800 for high moisture: 10 lbs. 95% RH pH 10

(v) Shaw 3800 indoor/outdoor 8 lbs. 90% RH pH 5-9
(vi) LokDots dry adhesive: No visible moisture pH 12
(vii) LokWorx tabs: 10 lbs. 85 RH pH 12
(viii) Mill-applied ES: No visible moisture
(a) For EcoLogix (attached cushion): All, excluding LokDots and LokWorx.
(ix) For StrataWorx (light weight tile alternative to broadloom)
(x) Shaw 5000 pressure sensitive: 5 lbs. 85% RH pH 5-9
(xi) Shaw 5036 with antimicrobial: 5 lbs. 85% RH pH 5-9
(xii) Shaw 5800 for high moisture: 10 lbs. 95% RH pH 10
(a) Primer (if needed): 9050 is an acrylic solution made to neutralize excess alkali that is also recommend as a primer coat to prevent over absorption of adhesive and to ensure a better bond. Formulated with an antimicrobial agent, it provides protection against bacteria, fungi, and mildew in the wet or dry state. Contains no solvent, alcohol, or other hazardous materials per OSHA 29 CFR 1910.1200. Non-photo chemically reactive per rule #102. Available in 4-gallon pails.
(b) Leveling and Patching Compounds: Use a cementitious patching/leveling compound that meets or exceeds the required moisture level and pH requirements. Use of gypsum-based patching and/or leveling compounds which contain Portland or high alumina cement and meet or exceed the compressive strength of 3,000 psi are acceptable.
(c) Transition Strips
(d) Cove Base Accessories:
i. Angle Profile
ii. Detail Profile
iii. Quarter Round Profile



PART 3 – EXECUTION

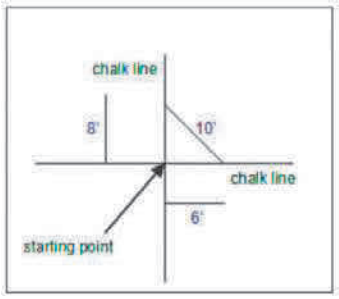
2.02 EXAMINATION
1. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content, pH, smoothness and level.
2. If dusting or powdering exists, seal the floor with a latex primer such as Shaw 9050.

2.03 PREPARATION

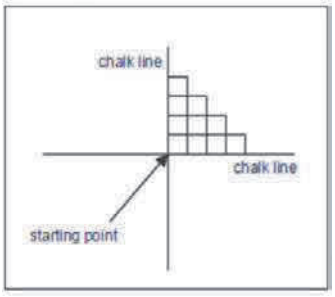
A. Substrates shall be smooth, structurally sound, permanently dry, clean and free of all foreign material such as dust, wax, solvents, paint, grease, oils, old adhesive residue, curing and hardening/ curing compounds, sealers and other foreign material that might prevent adhesive bond.
   1. Pre-existing Adhesive
      a. Non-Active Multipurpose Adhesive: Remove ridges, sweep or vacuum debris.
      b. Active Multipurpose Adhesive: Remove ridges then eliminate the adhesive tack with a product such as Shaw 6200.
      c. Pressure Sensitive Adhesive Affected by Plasticizer Migration: If the previous carpet tile had a PVC backing and the plasticizer in the backing has transferred to the adhesive, you must thoroughly remove adhesive by wet scrapping.
      d. Existing Pressure Sensitive Adhesive: Evaluate the tack level of the existing adhesive. If sufficient, the existing adhesive can be used to install Shaw's tile products. If insufficient, apply new adhesive over existing adhesive.
      e. Active Cutback Adhesive: Wet scrape adhesive, reduce to a well-bonded residue and encapsulate with a product such as Shaw 9000.
      f. Non-active Cutback Adhesive: Wet scrape adhesive and reduce to a well-bonded residue.
         (i) Fill depressions or cracks with a cementitious patching/leveling compound that meets or exceeds the required moisture level and pH requirements. Use of gypsum-based patching and/or leveling compounds which contain Portland or high alumina cement and meet or exceed the compressive strength of 3,000 psi are acceptable.
         (ii) Flooring considerations:
            (a) Installing over VCT and VAT: Tiles must be secure to the subfloor. Strip any wax from the surface.
            (b) Installing over wood subfloors: Prime with a liquid latex such as Shaw 9050.
            (c) Installing over raised access flooring: Must be smooth, level, secure and clean. Install carpet tile at an offset from panel seams. Gaps must not exceed 1/16" (1.6 mm).

B. LAYOUT AND INSTALLATION
   1. Installation shall be monolithic.
   2. Start the tile installation as near to the center of the room as possible and position it to use the largest perimeter cut tile size.
   3. Snap a chalk line parallel to one major wall bisecting the starting point. It may be necessary to offset the center chalk line to assure perimeter tiles will be at least half size.

4. Snap a second chalk line from the starting point at 90° to the first line. Use a 3-4-5, 6-8-10, or larger triangle depending on the room size. Meters or feet may be used to lay out the triangle in these proportions.



5. Use a full spread of adhesive applied with a 3/8" foam paint roller or 1/16 x 1/32 x 5/64 u-notch trowel. The adhesive must be allowed to dry completely before installing the carpet. Installing into wet adhesive will result into a permanent bond and may cause the carpet to bubble. Trowel application of adhesive is recommended for EcoLogix. EcoWorx ES / EcoLogix ES no adhesive required. Approximate coverage rates are 35-40 yards per gallon when applied with a roller, and 28 -33* yards per gallon when applied with a trowel.
6. Install each full carton and complete an entire pallet before starting another pallet to minimize product variation. Each tile has directional arrows on the back. These arrows allow for one-directional or multi-directional installation. Some styles may be large scale or linear in design and require quarter turning. If you are unsure about whether or not your product requires a quarter turned installation, please contact 1.877.502.7429. Numbers within the arrows are for manufacturing purposes and are not related to installation.
7. Begin installation at the intersection of two chalk lines. Continue until you complete one quadrant. Proceed to an adjoining quadrant until all four quadrants are completed. Larger areas may require chalk lines bisecting the original four quadrants. See figure



8. Install tiles using the pyramid technique. This gives you multiple alignment checks. If the edges do not align and the misalignment increases with progression of the installation, find and correct the source of the problem.
9. Carpet tiles come in various sizes. All Shaw tiles have directional arrows on the back of the tile. Slide tiles into position to prevent yarn from being trapped between the tiles. Trapped yarn will adversely affect the appearance of the installation and will cause alignment problems.
10. EcoWorx ES /EcoLogix ES are manufactured with the adhesive already applied. Once the tile is ready to install, simply peel the liner from the back and position snugly to the adjacent tile.
11. Tiles must fit snugly, but not be compressed. Press the entire surface of the tile to ensure adhesion. Check for fit by measuring the length of ten full tiles after installation. The measurement must not be less than, or exceed by more than 1/4 inch, the length of the tiles being multiplied by ten. For example: if 24" X 24" tiles are being installed, the measurement should be between 240 and 240 1/4 inches.
12. Measure and cut tiles from the back using a straight edge. Be sure the arrows are pointing in the correct direction.
13. Roll the entire installation with a 75 lb. or greater roller to assure the proper adhesion to the substrate.

2.04 MAINTENANCE

A. Post-installation Care

1. Place plywood over the carpet when heavy objects will be moved within 24 hours after installation.
2. Preventative Floor Care
    a. Use protective chair mats under chairs with casters.
    b. Use soil removal mats at exterior entrances.
    c. Use absorbent mats in areas where moisture, oil and grease are present.
3. Routine Maintenance
    a. Set a schedule depending on traffic and vacuum regularly.
        (i) Remove spots with spot removers as soon as they occur.
        (ii) Use encapsulation agents periodically.
        (iii) Clean with hot water extraction periodically.

Traffic Level	Vacuum	Spot Removal	Interim Cleaning	Hot Water Extraction
Light	2/week	As needed	As needed	1/year
Moderate	1/day	As needed	As needed	1/year
Heavy	1/day	As needed	Monthly	4/year
Extra Heavy	1/day	As needed	Weekly	Monthly

END OF SECTION

SECTION 09 68 16

BROADLOOM CARPET

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes carpet and installation.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 3 Sections for curing compounds and other concrete treatments compatibility with carpet adhesives.
   2. Division 9 Section "Resilient Wall Base and Accessories" for materials and installation.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of carpet material and installation accessory specified. Submit manufacturer's printed data on physical characteristics, durability, fade resistance, and fire-test-response characteristics. Submit methods of installation for each type of substrate.

C. Shop Drawings showing columns, doorways, enclosing walls or partitions, and locations where cutouts are required in carpet. Indicate the following:
   1. Carpet type, color, and dye lot.
   2. Seam locations, types, and methods.
   3. Pile direction.
   4. Type, color, and location of edge, transition, and other accessory strips.
   5. Transition details to other flooring materials.

D. Samples for verification of the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work. Label samples with manufacturer's name, material type, color, and pattern. Submit the following:
   1. 12-inch (300-mm-) square Samples of carpet material.
   2. 12-inch (300-mm) Samples of each type of exposed edge stripping and accessory item.

E. Maintenance data for carpet to include in the operation and maintenance manual specified in Division 1.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is certified by the Floor Covering Installation Board (FCIB) or who can demonstrate compliance with FCIB certification program requirements.

B. Single-Source Responsibility: Obtain carpet from one source and by a single manufacturer.

C. Carpet Fire-Test-Response Characteristics: Provide carpet with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify carpet with appropriate markings of applicable testing and inspecting agency. Surface Flammability: Passes CPSC 16 CFR, Part 1630.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 5: "Storage and Handling."

B. Deliver materials to Project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.

C. Store materials on-site in original undamaged packages, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, with continuous blocking off ground.

1.06 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6: "Site Conditions."

B. Space Enclosure and Environmental Limitations: Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

C. Subfloor Moisture Conditions: Moisture emission rate of not more than 3 lb/1000 sq. ft./24 hours (14.6 kg/1000 sq. m/24 hours) when tested by calcium chloride moisture test in compliance with CRI 104, 6.2.1, with subfloor temperatures not less than 55 deg F (12.7 deg C).

D. Subfloor Alkalinity Conditions: A pH range of 5 to 9 when subfloor is wetted with potable water and pHydrion paper is applied.

1.07 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Carpet Warranty: Submit a written warranty executed by carpet manufacturer and Installer agreeing to repair or replace carpet that does not meet requirements or that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination. Warranty Period: 10 years from date of Substantial Completion.

1.08 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet: Full width roll equal to 3 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 PRODUCTS

2.01 CARPET

A. Carpet material: 100% nylon, manufacturer's standard backing, with lifetime wear warranty, 3 year delamination and tuftbind failure warranty, Class I rated.

B. Labeling: All production of certified qualities of carpeting shall be back-printed for identification. The imprint must carry the identification of the quality both by name or code number(s), the Federally Registered Certification mark assigned to the manufacturer as well as the shield with the letters of the testing agency used to indicate that the carpet is certified under the program which is validated. The following testing agencies are acceptable for the certification of carpets: ALI--Associated Laboratories, Inc., MEA--Metallurgical Engineers of Atlanta, Inc., and ETL--Electrical Testing Laboratories, Inc. Furnish test results.

C. Carpet Products: Subject to compliance with requirements, use the following or approved equal. Provide carpet products complying with the following:

TILE CARPETING

1.	Manufacturer:	Patcraft
a.	Product:	Homeroom v. 3.0
b.	Construction:	Level Loop
c.	Fiber:	Solution Q Extreme Nylon
d.	Dye Method:	100% Solution Dyed
e.	Backing:	EcoWorx® Tile
f.	Protective Treatment:	SSP® Shaw Soil Protection
g.	Size:	24" x 24"

h.	Gauge:	1/8
i.	Stitches:	Per inch 7.8
j.	Finished Pile Thickness:	.156
k.	Average Density:	7615
l.	Total Thickness:	0.230
m.	Tufted Weight:	22.0 oz

2.02 INSTALLATION ACCESSORIES

A. Trowelable Underlayments and Patching Compounds: As recommended by carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, low VOC non-staining type to suit products and subfloor conditions indicated and to comply with flammability requirements for installed carpet as recommended by the carpet manufacturer.

C. Seaming Cement: Low VOC hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine subfloors and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting performance of carpet. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that subfloors and conditions are satisfactory for carpet installation and comply with requirements specified in this Section and those of the carpet manufacturer.

3.02 PREPARATION

A. General: Comply with carpet manufacturer's installation recommendations to prepare substrates indicated to receive carpet installation.

B. Level subfloor within 1/4 inch in 10 feet (6 mm in 3 m), noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.

C. Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by the carpet manufacturer.

D. Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.

E. Broom or vacuum clean subfloors to be covered with carpet. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust.

F. Concrete-Subfloor Preparation: Apply concrete-slab primer, according to manufacturer's directions, where recommended by the carpet manufacturer.

3.03 INSTALLATION

A. Direct Glue-Down Installation: Comply with CRI 104, Section 8: "Direct Glue-Down."

B. Comply with carpet manufacturer's recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position. Do not bridge building expansion joints with continuous carpet.

C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, including pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Transitions between pavers and carpet: Schluter Systems metal transition strip.

3.04 CLEANING

A. Perform the following operations immediately after completing installation.
1. Remove visible adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove protruding yarns from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.
   1. Concrete.
   2. Clay masonry.
   3. Concrete masonry units (CMU).
   4. Steel.
   5. Cast iron.
   6. Galvanized metal.
   7. Aluminum (not anodized or otherwise coated).
   8. Wood.
   9. Gypsum board.
   10. Plaster.
   11. Spray-textured ceilings.
   12. Cotton or canvas insulation covering.
   13. ASJ insulation covering.

B. Related Requirements:
   1. Section 09 91 13 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Indicate VOC content.

B. Sustainable Design Submittals:
   1. Product Data for LEED 2009 Credit EQ 4.2: For paints and coatings, showing printed statement of VOC content.
   2. Laboratory Test Reports: For paints and coatings, indicating compliance with LEED 2009 Credit EQ 4.2 requirements for low-emitting materials.

C. Samples for Initial Selection: For each type of topcoat product.

D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.

2. Label each coat of each Sample.
3. Label each Sample for location and application area.

E. Product List: For each product indicated, include the following:
1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Indicate VOC content.

1.04 CLOSEOUT SUBMITTALS

1. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer’s label with the following information:
1. Product name and type (description).
2. Batch date.
3. Color number.
4. VOC content.
5. Environmental handling requirements.
6. Surface preparation requirements.
7. Application instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.07 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Lead Paint: It is not expected that lead paint will be encountered in the Work.

1. If suspected lead paint is encountered, do not disturb; immediately notify Architect and Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); products indicated or comparable product from one of the following:
   1. Benjamin Moore & Co.
   2. PPG Architectural Coatings.
   3. Pratt & Lambert.
   4. Valspar Corporation - Architectural (Pro).

B. Comparable Products: Comparable products of approved manufacturers will be considered in accordance with Section 01 60 00 "Product Requirements," and the following:
   1. Products are approved by manufacturer in writing for application specified.
   2. Products meet performance and physical characteristics of basis of design product including published ratio of solids by volume, plus or minus two percent.

C. Source Limitations: Obtain paint materials from single source from single listed manufacturer.
   1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.02 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content:
   1. For field applications that are inside the weatherproofing system, paints and coatings shall provide materials that comply with VOC limits of authorities having jurisdiction and for interior paints and coatings applied at Project site, the following VOC limits exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Flat Paints and Coatings: 50 g/L.
      b. Nonflat Paints and Coatings: 150 g/L.
      c. Primers, Sealers, and Undercoaters: 200 g/L.
      d. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
      e. Floor Coatings: 100 g/L.
      f. Shellacs, Clear: 730 g/L.
      g. Shellacs, Pigmented: 550 g/L.

C. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small Scale Environmental Chambers."

D. Colors: As selected by Architect from manufacturer's full range.
   1. 20 percent of surface area will be painted with deep tones.

2.03 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
   1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:
   1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
      a. Concrete: 12 percent.
      b. Masonry (Clay and CMU): 12 percent.
      c. Wood: 15 percent.
      d. Gypsum Board: 12 percent.
      e. Plaster: 12 percent.
   2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
   3. Plaster Substrates: Verify that plaster is fully cured.
   4. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
   1. Concrete Floors: Remove oil, dust, grease, dirt, and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."
   3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
   4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.

2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed in equipment rooms:
a. Equipment, including panelboards and switch gear.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.
h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
2. Paint the following work where exposed in occupied spaces:
a. Equipment, including panelboards.
b. Uninsulated metal piping.

c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 INTERIOR MICROBICIDAL PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces and Clay Masonry:
1. Microbicidal Latex Finish System: With topcoat EPA registered No. 64695-1.
a. Prime Coat: Primer sealer, latex, interior:
(i) S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils (0.203 mm) wet, 3.2 mils(0.081 mm) dry.
(a) First Coat: Microbicidal Latex, interior, matching topcoat.
(b) Topcoat: Microbicidal Latex, interior, eggshell:
(ii) S-W Paint Shield Interior Latex Eg-Shel Microbicidal Paint, D12W51, at 4.0 mils (0.102 mm) wet, 1.8 mils (0.046 mm) dry, per coat. Brush and roll application only.

B. CMU Substrates:
1. Microbicidal Latex Finish System: With topcoat EPA registered No. 64695-1.
a. Block Filler: One or two coats as required: Block filler, latex, interior/exterior:
(i) S-W Loxon Block Surfacer, A24W200, at 10.0 mils (0.254 mm) wet, 8.0 mils (0.203 mm) dry, per coat.
(a) First Coat: Microbicidal Latex, interior, matching topcoat.
(b) Topcoat: Microbicidal Latex, interior, eggshell:
(ii) S-W Paint Shield Interior Latex Eg-Shel Microbicidal Paint, D12W51, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat. Brush and roll application only.

C. Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.
1. Microbicidal Latex Finish System: With topcoat EPA registered No. 64695-1.
a. Prime Coat: Primer, latex, interior, anti-microbial:
(i) S-W PrepRite ProBlock Interior/Exterior Latex Primer/Sealer, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry.
(a) First Coat: Microbicidal Latex, interior, matching topcoat.
(b) Topcoat: Microbicidal Latex, interior, eggshell:
(ii) S-W Paint Shield Interior Latex Eg-Shel Microbicidal Paint, D12W51, at 4.0 mils (0.102 mm) wet, 1.8 mils (0.046 mm) dry, per coat. Brush and roll application only.

D. Gypsum Board, Plaster, and Spray-Texture Ceiling Substrates:
1. Microbicidal Latex Finish System: With topcoat EPA registered No. 64695-1.
a. Prime Coat: Primer, latex, interior:
(i) S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils (0.102 mm) wet, 1.0 mils (0.025 mm) dry.
(a) First Coat: Microbicidal Latex, interior, matching topcoat.
(b) Topcoat: Microbicidal Latex, interior, eggshell:
(ii) S-W Paint Shield Interior Latex Eg-Shel Microbicidal Paint, D12W51, at 4.0 mils (0.102 mm) wet, 1.8 mils (0.046 mm) dry, per coat. Brush and roll application only.

3.07 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces and Clay Masonry:
1. Latex System:
a. Prime Coat: Primer, latex, interior.
(i) S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils (0.203 mm) wet, 3.2 mils (0.081 mm) dry.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, flat.
(i) S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.
d. Topcoat: Latex, interior, low sheen.
(i) S-W ProMar 200 Zero VOC Latex Low Sheen Eg-Shel, B24-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.
e. Topcoat: Latex, interior, eggshell.

(i) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils (0.102 mm) wet, 1.7 mils (0.043 mm) dry, per coat .

f. Topcoat: Latex, interior, semi-gloss.
(i) S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat .

g. Topcoat: Latex, interior, gloss.
(i) S-W ProMar 200 Zero VOC Gloss, B21-12650 Series, at 4.0 mils (0.102 mm) wet, 1.4 mils (0.036 mm) dry, per coat.

2. Water-Based Light Industrial Coating System:
a. Prime Coat: Primer sealer, latex, interior:
(i) S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils (0.203 mm) wet, 3.2 mils (0.081 mm) dry.
(a) Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
(b) Topcoat: Light industrial coating, interior, water based, eggshell:
(ii) S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K45-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.

b. Topcoat: Light industrial coating, interior, water based, semi-gloss:
(i) S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K46-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.

B. Two-Component Epoxy and Epoxy High Build Systems for Non-Traffic Surfaces: Refer to Section 09 96 00 "High-Performance Coatings."
1. Concrete Stain System (Water-based) for Vertical Surfaces:
a. First Coat:
(i) S-W H&C Colortop Water-Based Solid Color Concrete Stain, at 50 to 300 sq. ft. per gal.(1.23 to 7.36 sq. m per liter).

b. Second Coat:
(i) S-W H&C Colortop Water-Based Solid Color Concrete Stain, at 50 to 300 sq. ft. per gal.(1.23 to 7.36 sq. m per liter).

C. Concrete Substrates, Pedestrian Traffic Surfaces:
1. Latex Floor Enamel System:
a. First Coat: Floor paint, latex, slip-resistant, matching topcoat.
b. Topcoat: Floor paint, latex, slip-resistant, low gloss: S-W ArmorSeal Tread-Plex, B90 Series, at 1.5 to 2.0 mils (0.038 to 0.051 mm) dry per coat.

2. Clear Acrylic System, Gloss Finish:
a. First Coat:
(i) S-W H&C Clarishield Water-Based Wet-Look Concrete Sealer, at 100 to 200 sq. ft. per gal. (2.45 to 4.91 sq. m per liter).

b. Second Coat:
(i) S-W H&C Clarishield Water-Based Wet-Look Concrete Sealer, at 100 to 200 sq. ft. per gal. (2.45 to 4.91 sq. m per liter).

D. Concrete Stain System (Water-based):
1. First Coat: Low-luster opaque finish:
a. S-W H&C Colortop Water-Based Solid Color Concrete Stain, at 50 to 300 sq. ft. per gal. (1.23 to 7.36 sq. m per liter).
(i) Second Coat: Low-luster opaque finish:

b. S-W H&C Colortop Water-Based Solid Color Concrete Stain, at 50 to 300 sq. ft. per gal. (1.23 to 7.36 sq. m per liter).

2. Epoxy and Urethane Coatings: Refer to Section 09 96 00 "High-Performance Coatings."
3. Epoxy- and Urethane- Based Aggregate-Filled Floor Surfacing: Refer to Section 09 67 23 "Resinous Flooring."

E. CMU Substrates:
1. Latex System:
   a. Block Filler: Block filler, latex, interior/exterior:
      (i) S-W PrepRite Block Filler, B25W25, at 75-125 sq. ft. per gal. (1.84 to 3.07 sq. m per liter).
   b. Intermediate Coat: Latex, interior, matching topcoat.
2. Topcoat: Latex, interior, flat:
   a. S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.
   b. Topcoat: Latex, interior, low sheen:
      (i) S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.
   c. Topcoat: Latex, interior, eggshell:
      (i) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils (0.102 mm) wet, 1.7 mils (0.043 mm) dry, per coat.
   d. Topcoat: Latex, interior, semi-gloss:
      (i) S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.
   e. Topcoat: Latex, interior, gloss:
      (i) S-W ProMar 200 Zero VOC Gloss, B21-12650 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.
3. Water-Based Light Industrial Coating System:
   a. Block Filler: Block filler, latex, interior/exterior:
      (i) S-W PrepRite Block Filler, B25W25, at 75-125 sq. ft. per gal. (1.84 to 3.07 sq. m per liter).
   b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
   c. Topcoat: Light industrial coating, interior, water based, eggshell:
      (i) S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K45-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.
   d. Topcoat: Light industrial coating, interior, water based, semi-gloss:
      (i) S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K46-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.
4. Concrete Stain System (Water-based):
   a. First Coat:
      (i) S-W H&C Colortop Water-Based Solid Color Concrete Stain, at 50 to 300 sq. ft. per gal. (1.23 to 7.36 sq. m per liter).
   b. Second Coat:
      (i) S-W H&C Colortop Water-Based Solid Color Concrete Stain, at 50 to 300 sq. ft. per gal. (1.23 to 7.36 sq. m per liter).

(a) Two-Component Epoxy and Epoxy High Build Systems for Non-Traffic Surfaces: Refer to Section 09 96 00 "High-Performance Coatings."
(b) Epoxy and Urethane Coatings: Refer to Section 0996 00 "High-Performance Coatings."

F. Metal Substrates (Aluminum, Steel, Galvanized Steel):
1. Latex System:
a. Prime Coat: Primer, rust-inhibitive, water based:
(i) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10 mils (0.127 to 0.254 mm) wet, 2.0 to 4.0 mils (0.051 to 0.102 mm) dry.
b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.
c. Topcoat: Water-based acrylic, semi-gloss:
(i) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils (0.064 to 0.102 mm) dry, per coat.
d. Topcoat: Water-based acrylic, gloss:
(i) S-W Pro Industrial Acrylic Gloss Coating, B66-660 Series, at 2.5 to 4.0 mils (0.064 to 0.102 mm) dry, per coat.
2. Water-Based Dry-Fall System:
a. Top Coat: Dry-fall latex, flat:
(i) S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-181 Series, at 6.0 mils (0.152 mm) wet, 1.5 mils (0.038 mm) dry.
b. Top Coat: Dry-fall latex, eggshell:
(i) S-W Pro Industrial Waterborne Acrylic DryFall Eg-Shel, B42-82, at 6.0 mils (0.152 mm) wet, 1.9 mils (0.048 mm) dry.
c. Top Coat: Dry-fall latex, semi-gloss:
(i) S-W Pro Industrial Waterborne Acrylic DryFall Semi-Gloss, B42-83, at 5.8 mils (0.147 mm) wet, 2.3 mils (0.058 mm) dry.
3. Water-Based Light Industrial Coating System:
a. Prime Coat: Primer, rust-inhibitive, water based:
(i) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10 mils (0.127 to 0.254 mm) wet, 2.0 to 4.0 mils (0.051 to 0.102 mm) dry.
(ii) Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
(iii) Topcoat: Light industrial coating, interior, water based, eggshell:
(a) S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K45-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.
b. Topcoat: Light industrial coating, interior, water based, semi-gloss:
(i) S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K46-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.
(a) Two-Component Epoxy and Epoxy High Build Systems: Refer to Section 09 96 00 "High-Performance Coatings."
4. Waterbased/Alkyd Urethane System:
a. Prime Coat:
(i) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10 mils (0.127 to 0.254 mm) wet, 2.0 to 4.0 mils (0.051 to 0.102 mm) dry.

(a) Intermediate Coat: Water-based acrylic-alkyd, interior, matching topcoat.

i. Topcoat: Water-based alkyd-urethane, semi-gloss, interior:

ii. S-W Pro Industrial Waterbased Alkyd Urethane Semi-Gloss, B53-1150 Series, at 4.0 mils (0.102 mm) wet, 1.4 mils (0.036 mm) dry, per coat.

b. Topcoat: Water-based alkyd-urethane, gloss, interior:

(i) S-W Pro Industrial Waterbased Alkyd Urethane Gloss, B53-1050 Series, at 4.0 mils (0.102 mm) wet, 1.4 mils (0.036 mm) dry, per coat.

(a) Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.

c. Latex System:

(i) Prime Coat: Primer sealer, latex, interior:

(a) S-W PrepRite ProBlock Primer Sealer, B51-620 Series, at 4.0 mils (0.102 mm) wet, 1.4 mils (0.036 mm) dry.

(b) Intermediate Coat: Latex, interior, matching topcoat.

d. Topcoat: Latex, interior, eggshell:

(i) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils (0.102 mm) wet, 1.7 mils (0.043 mm) dry, per coat.

e. Topcoat: Latex, interior, semi-gloss:

(i) S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.

f. Topcoat: Latex, interior, gloss:

(i) S-W ProMar 200 Zero VOC Gloss, B21-12650 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.

G. Waterbased/Alkyd Urethane System:

a. Prime Coat: Primer sealer, latex, interior:

(i) S-W Premium Wall & Wood Primer, B28W8111, at 4.0 mils (0.102 mm) wet, 1.8 mils (0.046 mm) dry.

(a) Intermediate Coat: Water-based alkyd-urethane, interior, matching topcoat.

(b) Topcoat: Water-based alkyd-urethane, semi-gloss, interior:

(ii) S-W Pro Industrial Waterbased Alkyd Urethane Semi-Gloss, B53-1150 Series, at 4.0 mils (0.102 mm) wet, 1.4 mils (0.036 mm) dry, per coat.

b. Topcoat: Water-based alkyd-urethane, gloss, interior:

(i) S-W Pro Industrial Waterbased Alkyd Urethane Gloss, B53-1050 Series, at 4.0 mils (0.102 mm) wet, 1.4 mils (0.036 mm) dry, per coat.

c. Water-Based Light Industrial Coating System:

(i) Prime Coat: Primer sealer, latex, interior:

(ii) S-W PrepRite ProBlock Primer Sealer, B51-620 Series, at 4.0 mils (0.102 mm) wet, 1.4 mils (0.036 mm) dry.

(a) Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.

(b) Topcoat: Light industrial coating, interior, water based, eggshell:

(iii) S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K45-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.

d. Topcoat: Light industrial coating, interior, water based, semi-gloss:

(i) S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K46-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.
(a) Two-Component Epoxy and Epoxy High Build Systems: Refer to Section 09 96 00 "High-Performance Coatings."

H. Wood Substrates, Pedestrian Traffic Surfaces:
1. Latex Floor Enamel System:
a. First Coat: Floor paint, latex, slip-resistant, matching topcoat.
b. Topcoat: Floor paint, latex, slip-resistant, low gloss:
(i) S-W ArmorSeal Tread-Plex, B90 Series, at 1.5 to 2.0 mils (0.038 to 0.051 mm) dry per coat.

I. Gypsum Board, Plaster, and Spray-Texture Ceiling Substrates:
1. Latex System:
a. Prime Coat: Primer, latex, interior:
(i) S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils (0.102 mm) wet, 1.0 mils (0.025 mm) dry.
(a) Intermediate Coat: Latex, interior, matching topcoat.
(b) Topcoat: Latex, interior, flat:
(ii) S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.
b. Topcoat: Latex, interior, low sheen:
(i) S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.
c. Topcoat: Latex, interior, eggshell:
(i) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils (0.102 mm) wet, 1.7 mils (0.043 mm) dry, per coat.
d. Topcoat: Latex, interior, semi-gloss:
(i) S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.
e. Topcoat: Latex, interior, gloss:
(i) S-W ProMar 200 Zero VOC Gloss, B21-12650 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.
2. Water-Based Light Industrial Coating System:
a. Prime Coat: Primer sealer, latex, interior:
(i) S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils (0.102 mm) wet, 1.0 mils (0.025 mm) dry.
(ii) Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
b. Topcoat: Light industrial coating, interior, water based, eggshell:
(i) S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.
c. Topcoat: Light industrial coating, interior, water based, semi-gloss:
(i) S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-151 Series, at 4.0 mils (0.102 mm) wet, 1.5 mils (0.038 mm) dry, per coat.
(a) Two-Component Epoxy and Epoxy High Build Systems for Non-Traffic Surfaces: Refer to Section 09 96 00 "High-Performance Coatings."

END OF SECTION

SECTION 10 21 16.19

PLASTIC SHOWER AND DRESSING COMPARTMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Solid-plastic compartments.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For shower and dressing compartments.
1. Include plans, elevations, sections, and attachment details.

C. Samples: For each exposed product and for each color and texture specified.

1.03 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.

B. Regulatory Requirements: Comply with applicable provisions in USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 for shower and dressing compartments designated as accessible.

2.02 SOLID-PLASTIC COMPARTMENTS

A. Configuration: As indicated on Drawings.

B. Enclosure Style: Floor and ceiling anchored.

C. Panel and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges and with homogenous color and pattern throughout thickness of material.
1. Heat-Sink Strip: Manufacturer's standard, continuous, stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.

2. Color and Pattern: in each room; as selected by Architect from manufacturer's full range.

D. Door Construction: Match panels.

E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.

F. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; solid plastic matching the panels or clear-anodized extruded aluminum.
2. Stirrup Type: Ear or U-brackets; stainless steel.

2.03 ACCESSORIES

A. Clothing Hooks: Manufacturer's standard clothing hooks in each dressing compartment.

B. Overhead Bracing: Manufacturer's standard, continuous, extruded-aluminum headrail or cap with antigrip profile; in manufacturer's standard finish.

C. Curtain Rod with Hooks: Manufacturer's standard, 1-inch-diameter, stainless steel curtain rod with matching hooks.

D. Curtain: Flame-resistant, polyester-reinforced vinyl fabric that is stain resistant, self-sanitizing, antistatic, antimicrobial, and launderable to a temperature of not less than 90 deg F.
1. Labeling: Identify fabrics with appropriate markings of applicable testing and inspecting agency.
2. Length: Curtain shall be provided with clear vinyl vision area extending 12-inches from the top of the curtain and bottom of curtain will terminate 6-inches above finished floor.
3. Color and Pattern: As selected by Architect from manufacturer's full range.

E. Seats: Manufacturer's standard, wall-mounted benches.
1. Material: Solid phenolic.
2. Operation: Folding.
3. Finish: As selected by Architect from manufacturer's full range.

F. Anchorages and Fasteners: Manufacturer's standard, exposed fasteners of stainless steel, chrome-plated steel, or solid brass, finished to match the items they are securing; with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications.

2.04 FABRICATION

A. Overhead-Braced Compartments: Manufacturer's standard, corrosion-resistant supports, leveling method, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling method.

B. Floor-and-Ceiling-Anchored Compartments: Manufacturer's standard, corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install compartments rigid, straight, level, and plumb. Secure compartments in position with manufacturer's recommended anchoring devices.
   1. Clearances for Dressing Compartments: Maximum 1/2 inch between pilasters and panels; 1 inch between panels and walls.
   2. Full-Height (Continuous) Brackets for Dressing Compartments: Secure panels to walls and to pilasters with full-height brackets.
      a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
      b. Align brackets at pilasters with brackets at walls.

B. Curtains: Install curtains to specified length, and verify that they hang vertically without stress points or diagonal folds.

3.02 ADJUSTING

A. Curtain Adjustment: After hanging curtains, test and adjust each track or rod to produce unencumbered, smooth operation. Steam and dress down curtains as required to produce crease- and wrinkle-free installation. Remove and replace curtains that are stained or soiled or that have stress points or diagonal folds.

B. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION

SECTION 10 51 13

METAL LOCKERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Welded corridor lockers.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For metal lockers.
1. Include plans, elevations, sections, and attachment details.
2. Include locker identification system and numbering sequence.

C. Samples: For each color specified.

1.04 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.06 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
1. Warranty Period for Welded Metal Lockers: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers and locker benches indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.02 WELDED CORRIDOR LOCKERS

A. Subject to compliance with requirements provide metal lockers by one of the following manufacturers:

1. PENCO
2. ASI Storage Solutions
3. Republic Storage Systems

B. Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
   1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
   2. Door Style: Vented panel as follows:
      a. Louvered Vents: No fewer than two louver openings at top and bottom, or three louver openings at top or bottom, for triple-tier lockers.

C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
   1. Tops, Bottoms, and Sides: 0.060-inch nominal thickness.
   2. Backs: 0.048-inch nominal thickness.
   3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.

D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

E. Hinges:
   1. Continuous Hinges: Manufacturer's standard, steel, full height.

F. Projecting Door Handle and Latch: Finger-lift latch control designed for use with either built-in combination locks or padlocks; positive automatic latching, chromium plated; pry and vandal resistant.
   1. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
   2. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
   3. Single-Point Latching: Nonmoving latch hook with steel padlock loop that projects through recessed cup and is finished to match metal locker body.
      a. Latch Hook: Equip each door with one latch hook.

G. Locks: Combination padlocks.

H. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

I. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.

J. Coat Rods: Manufacturer's standard.

K. Legs: 6 inches high; formed by extending vertical frame members, or fabricated from 0.075-inch nominal-thickness steel sheet; welded to bottom of locker.
   1. Provide closed front and end bases.

L. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
   1. Closures: Vertical-end type.

M. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.

N. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

O. Materials:
   1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

P. Finish: Baked enamel or powder coat.
   1. Color: As selected by Architect from manufacturer's full range.

2.03 LOCKS

A. Combination Padlock: Provided by Owner.

2.04 LOCKER BENCHES

A. Subject to compliance with requirements provide metal lockers by one of the following manufacturers:
   1. PENCO
   2. ASI Storage Solutions
   3. Republic Storage Systems

B. Provide bench units with overall assembly height of 17-1/2 inches.

C. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
   1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick except provide 20- to 24-inch-wide tops where accessible benches are indicated.
   2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.

D. Fixed-Bench Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors.
   1. Color: As selected by Architect from manufacturer's full range.

E. Materials:
   1. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.

2.05 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Equipment: Provide each locker with an identification plate and the following equipment:
   1. Triple-Tier Units: One double-prong ceiling hook.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds smooth and flush.

E. Accessible Lockers: Fabricate as follows:
   1. Locate bottom shelf no lower than 15 inches above the floor.
   2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

G. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.

H. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

I. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

J. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

K. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install lockers level, plumb, and true; shim as required, using concealed shims.
   1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
   2. Anchor single rows of metal lockers to walls near top and bottom of lockers.

3. Anchor back-to-back metal lockers to floor.

B. Welded Lockers: Connect groups together with manufacturer's standard fasteners, with no exposed fasteners on face frames.

C. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
   1. Attach recess trim to recessed metal lockers with concealed clips.
   2. Attach filler panels with concealed fasteners.
   3. Attach sloping-top units to metal lockers, with closures at exposed ends.
   4. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

D. Fixed Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches apart.

END OF SECTION

SECTION 12 36 16

METAL COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Stainless-steel countertops.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For metal fabrications.
1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
2. For countertops, show locations and sizes of cutouts and holes for items installed in metal countertops.

PART 2 PRODUCTS

2.01 STAINLESS-STEEL FABRICATIONS

A. Countertops: Fabricate from 0.062-inch-thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch.
1. Joints: Fabricate countertops in sections for joining in field.
2. Weld shop-made joints.
3. Sound deaden the undersurface with heavy-build mastic coating.
4. Extend the top down to provide a 1-inch-thick edge with a 1/2-inch return flange.

2.02 MATERIALS

A. Stainless-Steel Sheet: ASTM A240/A240M, Type 304.

B. Sealant for Countertops: Manufacturer's standard sealant that complies with applicable requirements in Section 07 92 00 "Joint Sealants" and the following:
1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
2. Color: Clear.

2.03 STAINLESS-STEEL FINISH

A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.

B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

C. Secure countertops to brackets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.

D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

E. Seal junctures of countertops, splashes, and walls with sealant for countertops.

F. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION

SECTION 12 36 61.19

QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Quartz agglomerate countertops.
2. Quartz agglomerate apron fronts.

1.02 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples: For each type of material exposed to view.

PART 2 PRODUCTS

2.01 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
1. Subject to compliance with requirements provide quartz agglomerate countertops by one of the following:
a. Cambria
b. Daltile
2. Colors and Patterns: As selected by Architect from manufacturer's full range.

B. Solid Wood Edges and Trim: Clear red oak lumber, free of defects, selected for compatible grain and color, and kiln dried to 7 percent moisture content.

C. Particleboard: ANSI A208.1, Grade M-2.

2.02 COUNTERTOP FABRICATION

A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
1. Grade: Custom.

B. Configuration:
1. Front: Straight, slightly eased at top

C. Countertops: 1/4-inch-thick, quartz agglomerate.

D. Joints: Fabricate countertops without joints.

E. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.

2.03 INSTALLATION MATERIALS

A. Adhesive: Product recommended by quartz agglomerate manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 EXECUTION

3.01 INSTALLATION

A. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

B. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions.

C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.

E. Install aprons to backing and countertops with adhesive.

F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

G. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION

SECTION 14 90 10

INMATE PROPERTY STORAGE CONVEYOR SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Furnish labor, materials, tools, equipment and services for Inmate Property Storage and Retrieval Conveyor System(s), as indicated in accordance with provisions of Contract Documents.

B. Coordinate with work of other trades on site.

1.02 SUBMITTALS

A. Shop Drawings:
1. Manufacturer's installation instructions and recommendations.
2. General Arrangement Drawings indicating conveyor path, drive and take-up locations, and support points.
3. Electrical Schematics.

B. Contract Closeout Information:
1. Manufacturer's Owner's and Maintenance Manual.
2. Recommended Spare Parts Listing.
3. Warranty.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Inmate Property Storage and Retrieval Conveyor System:
1. Pacline Conveyors, Inc.
www.pacline.com
Buffalo, NY
Ph: 800-955-8860
E-mail: sales@pacline.com

B. Accessories and other items

2.02 SYSTEM

A. Basis of Design: Pacline's PAC-LINE™ compact, medium capacity conveyor system.

B. Design:
1. Enclosed round track, monorail chain conveyor of modular, bolt together construction. Conveyor chain has integral load pendants at 6" pitch, eliminating the need for separate chain attachments. The Inmate Property Storage and Retrieval Conveyor System includes additional components to allow property bags to be suspended under the conveyor chain, and automatically moved to the user when requested through The Retriever™ controller.

2. Conveyor overall length is 260 linear feet of conveyor chain total, consisting of (2) independent conveyors, with the capacity to store a minimum of 1000 property bags at (2) bags per foot per tier.
3. Type and size of bags to be stored are: Solid Nylon Mesh Bag with sewn in chrome plated hanger, Item PL-PCSB205961, 28" tall x 20" wide – Overall Length 36"

C. Track:
1. Zinc Plated Round Track 1-7/8" OD x 1-5/8" ID.
2. End flanges with bolted connection.
3. The track encapsulates the moving chain eliminating pinch points for personnel.

D. Conveyor Chain:
1. PAC-LINE™ Conveyor Chain integral pendants, 6" pitch.
2. Lubrication: pregreased with Pacline approved lithium grease.
3. Breaking load: 3,700 LBS.
4. Maximum Chain length per drive: 600'-0", dependent on conveyor loading and chain pull.
5. Minimum friction coefficient: 2.5%
6. Maximum load per pendant: 50 LBS.

E. Take-Up:
1. Spring activated take-up device to maintain tension on the conveyor chain.
2. Integral track slip joints to allow the take-up to "float" relative to the conveyor track.
3. Round tube runners and internal trolley mechanism allow mounting of take-up to fixed support.

F. Bag Racks and Debris Guards
1. 2-Tiered Bag Racks, Zinc Plated steel, laser cut racks provided with 3 holes/openings per foot to accept typical property storage bags.
2. Location code labels attached adjacent to each rack opening.
3. Debris guards, 12" long, provided mounted between two conveyor chain pendants. Debris guards include pivoting clevis type mounting brackets to attach to chain above and garment rack below.
4. Debris guards overlap on both leading and trailing ends to prevent potential debris from above to drop onto garments.
5. Debris guards include integral perimeter lip.

G. Drive:
1. Conveyor Drive: In-line "Caterpillar" type.
2. Gearbox:
   a. Gearmotor drive unit with 20:1 single reduction ratio typical.
   b. Secondary gear reduction by chain and sprocket assembly.
   c. Drive module mounted above conveyor chain with indirect connection to conveyor chain by drive pusher "dogs".
   d. Capable of reversing drive direction.
3. Motors:
   a. 1HP gearmotor, AC NEMA, 5:1, IP55.
   b. Power supply: 230V or 460V/ 3PH/ 60Hz.
   c. RPM: 1725.

4. Drive Sprockets:
    a. Hardened B-type sprockets for RC-60 roller chain.
    b. Welded 1-1/4" diameter steel shaft.
    c. Support: two cast iron, permanently lubricated, pillow block bearings.

H. Floor Supports welded construction
1. Arms: 3"x3"x ¼" or 4"x4"x ¼" steel angle.
2. Posts: 3"x3"x 3/16" or 4"x4"x 3/16" HSS.
3. Base Plate: 10"x10"x ½".
4. Wedge anchors: ½" DIA that penetrate the concrete floor at least 3-1/2".
5. Floor Supports spacing: not to exceed 8 '-0" apart.
6. Floor supports must not require lateral bracing from building wall, ceiling or other structure.

I. Electrical:
1. Variable Frequency Drive (VFD) unit:
    a. Model Powerflex 525 series.
    b. Input electrical connection: 120V/60 Hz/1PH, Output to motor 230V/60Hz/3PH.
    c. Installation bracket: type 1 B frame – 520 series.
2. Pushbutton station
    a. E-stop button with twist to release mounted adjacent to VFD and Pacline The Retriever™ controller.

J. Operating Control:
1. Automatic Storage/Retrieval Controller
    a. The Retriever™ by Pacline, microprocessor-based conveyor controller.
    b. Touchscreen operation to allow user to enter up to five (5) storage location codes in a queue for retrieval operation.
    c. Automatic forward/reverse operation to minimize conveyor time to move a specified garment rack to the operator.

2.03 ACCESSORIES AND OTHER ITEMS

A. Property Storage Bags
1. Quantity: 1100

PART 3 EXECUTION

3.01 INSPECTION

A. Site will be inspected prior to start of work. A report will be provided to the client stating any unsatisfactory conditions. Site work will not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Appropriate party to correct unsatisfactory conditions prior to start of work.

3.03 INSTALLATION

A. Only Pacline Conveyors, Inc. approved installation crew will perform equipment installation.

B. Upon completion of mechanical installation, Garment Storage and Retrieval System will be adjusted for proper operation.

C. Electric wiring within system by supplier.

D. Site electric power wiring by others per Electrical Specification Divisions.

3.04 OPERATION AND MAINTENANCE INSTRUCTION

A. Provide operation and maintenance training sessions for Owner's personnel.

END OF SECTION

Williamson County
Magistrate Court
306 West 4th St.
Georgetown, TX 78626

I hereby certify that the mechanical, electrical and plumbing engineering specifications for this project were prepared by me, or under my direct supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Texas.

The Texas Board of Professional Engineers, P.O. Drawer 18329, Austin, Texas 78760-8239, telephone (512) 440-7723, has jurisdiction over individuals licensed under the Texas Engineering Practice Act, Texas Civil Statutes, Article 3271a.

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TX Firm 3271
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Lockhart, Tx 78644
512-451-6579
tomalex@talexinc.com

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SECTION 22 01 00

GENERAL REQUIREMENTS FOR PLUMBING WORK

PART 1 - GENERAL

1.1 SCOPE

A. This project involves construction of the project as titled above with associated site work as shown on the plans and described herein.

1.2 DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements. Contractor shall determine exact locations from field measurements. Refer also to all architectural, structural, etc., drawings. The lack of specific detail of all offsets, transitions, etc., shall not relieve the Contractor of responsibility to provide such necessary elements to coordinate his work with building construction and with other trades.

1.3 SUBSTITUTION

A. All bids shall be based only on the equipment and materials as scheduled on the drawings and/or as specified, or on equivalent equipment and materials from a pre-approved alternative manufacturer. No bids may be based on a substitute or other alternative without specific written prior approval from the Engineer. Any Bidder who assumes equivalence of products and who bases his/her bid on that assumption, does so at their own risk.

B. A listing of approved alternative manufacturers does not mean that all products of a particular alternative manufacturer are acceptable alternatives to the scheduled items; it merely means that for bidding prior approval is not required. All fixtures and devices must still be submitted according to the prescribed procedures. In addition, some items that have an important visual affect, e.g. electric water coolers, may be required to receive Engineer's or Owner's approval also.

C. Substitute equipment, components, devices and systems shall be fully compatible with the design intent and complete with all required costs included in the bid amount. This includes all modifications to support, structure, pipe and electrical sizing and components needed and all other items necessary for the substitute to perform with no additional cost to the project.

1.4 INTENT

A. All equipment, materials and labor that may be necessary to complete work in accordance with the intent of these plans and specifications shall be furnished by the Contractor without additional cost.

B. All systems represented in the documents shall, unless specifically noted to the contrary, be provided and installed complete with all necessary components to form a complete and functioning system. Submission of bids will be considered confirmation that complete and functional systems have been included in the bids.

C. If any discrepancies or confusion is perceived in the documents, the Contractor shall call such to the attention of the Engineer for clarification of the documents prior to bidding or construction. If any inconsistencies or contradictions within the construction documents are discovered after the construction contracts are awarded, the Engineer shall determine the intent and correct interpretation of the construction documents.

D. Contractor shall supervise and direct the work competently and efficiently and in accordance with the drawings and specifications. Contractor shall be responsible for using construction means, methods, techniques, sequences, and procedures as are compatible with the project's requirements and will result in a project completed in accordance with the requirements of the drawings and specifications.

1.5 CODES, PERMITS AND FEES

A. Contractor shall comply with all local, state and national codes and shall pay for all applicable costs, fees and permits.

1.6 CONNECTION TO UTILITIES

A. Coordinate connections to utilities directly with utility providers.

B. Verify location, size, elevation, pressure, and any other pertinent data of existing utilities. Additional costs incurred due to a failure to verify such data and to coordinate associated work with respective utility providers shall be borne by Contractor.

C. All costs associated with providing utilities including, but not limited to, connection fees, boring under roads, etc., shall be included in the Contractor's bid price whether such costs are incurred by Contractor or charged by a utility company.

D. Submission of a bid by a Contractor shall be considered an acknowledgment by the Contractor of his compliance with this section.

E. Contractor shall connect water and waste piping and gas service to existing services in accordance with utility company regulations and shall pay all applicable fees and costs. NOTE: Excavate by hand and with caution to locate all utilities prior to machine excavation. Should any service be interrupted, Contractor shall repair it immediately and at no additional cost.

1.7 VIBRATION AND NOISE

A. Each of the various pieces of equipment shall operate without objectionable vibration or noise. All rotating equipment shall be statically and dynamically balanced and shall be mounted, supported, and fastened so that vibration shall not exceed levels specified for the equipment item. The specific type of vibration isolation to be installed shall be submitted to the Engineer for his approval.

B. If, in the opinion of the Engineer, objectionable vibration or noise or transmission thereof to the building occurs, the Contractor shall execute remedial measures as may be necessary to eliminate such unsatisfactory operating conditions and the work and material thereby required shall be furnished and performed at the Contractor's expense.

1.8 GUARANTEE

A. Each Contractor shall guarantee all labor and materials furnished by him for a period of one year unless otherwise noted. Guarantee period shall extend from the time of final written acceptance of the installation or upon usage by a written directive from the Owner, whichever occurs first. The guarantee shall cover the repair or replacement, without additional cost to the Owner, of any defective material or faulty workmanship.

1.9 SERVICE

A. All necessary service of each system, such as adjustment of controls, air distribution, and water balancing valves, mechanical repair of equipment, and other work requiring specialized

training, shall be furnished by the Contractor, at no cost to the Owner, for a period of one year, concurrent with the warranty period specified above.

1.10 SAFETY

A. General
   1. Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work, and Contractor shall comply with all laws governing safety, specifically the "Occupational Safety and Health Standards" and the "Safety and Health Regulations for Construction", state and federal.

B. Hazardous Chemicals
   1. According to OSHA, a hazardous chemical is any chemical which is a physical hazard or a health hazard. This may include items such as paints, solvents, adhesives, sealants, cleaners, etc. If a contractor produces, uses, or stores hazardous chemicals at the workplace, then contractor shall develop, implement, and maintain a hazard communication program in compliance with latest OSHA requirements. In projects with multiple tenants in which the building is partially occupied during the project, contractor shall inform the building manager or owner, according to OSHA guidelines, of any hazardous chemicals being produced, stored, or used in the building so that other tenants may be notified. Contractor shall employ required methods of training, information, handling, ventilation, labeling, storing, disposal, and removal of hazardous chemicals.

1.11 COORDINATION

A. Each Contractor's bid shall include the necessary detail and interconnection work to coordinate his work with the work of other trades. Failure on the part of the Contractor to coordinate with all other trades resulting in interferences shall be sufficient reason to require the Contractor to replace or rebuild the work involved at no extra charge.

1.12 STORAGE OF MATERIALS

A. Each Contractor shall provide temporary storage facilities suitable for equipment stored at the job site. Storage facilities shall be rain-proof and lockable as required. Materials or equipment stored on site but not in a lockable, rain-proof storage facility shall be stored above ground or above slab. Contractor shall take necessary precautions to prevent entry of and/or damage from dirt, trash, water, or vermin. Equipment not properly stored and protected shall be, at the discretion of the Engineer, replaced at no cost to Owner. Roofs are not acceptable storage areas unless specifically allowed in writing by the Engineer.

PART 2 - PRODUCTS

2.1 SUBMITTALS

A. Provide submittal to the A/E within 45 days of commencement of the Contractor’s agreement with the Owner.

B. In addition, submit specific information on equipment, products, and principal materials specified. Indicate and provide names of manufacturers, catalog and model numbers, cut sheets, and such other supplementary information as necessary for evaluation. Include all items mentioned by model number and/or manufacturer's name in the specifications or on the drawings, including but not limited to the following:
   1. Plumbing - Fixtures, piping systems, valves, insulation, equipment and other principal materials.

2. Fire Protection - Devices, materials and layout of system.

C. Coordinate placement of components and equipment with other contractors to determine any conflicts and assure proper clearances. Prepare and submit large scale coordinated shop drawings (minimum ¼"= 1'-0") of the central mechanical room, central electrical room and each individual electrical room. These drawings shall show to scale the actual sizes of each piece of selected mechanical, plumbing and electrical equipment along with the required clearances for maintenance or removal/replacement. Provide bottom of pipe, duct, equipment or other such vertical obstructions. Provide sections where necessary and as requested by the Engineer for clarity to describe equipment heights, piping elevations and other such clearance issues. Drawings shall be prepared on maximum 30" X 42" sheets using AutoCad® 2014 format. Submit 6 copies of the drawing sheets and a compact disk with the drawing files.

D. Requirements for submittal
   1. Each submittal shall:
      a. bear a stamp or specific written indication that Contractor has reviewed and approved all submittals prior to submission to Engineer,
      b. have all information deleted by Contractor that pertains to the means and methods of construction or to the fabrication, assembly, installation, or erection process (approval by Engineer shall not extend to these areas unless specifically noted by Engineer),
      c. be clearly marked as to which specific piece of equipment is being submitted, by use of a permanent marker, stamp, etc., so as to distinguish it from other pieces of equipment that may occur on the same page,
      d. be clearly marked as to which available options are being submitted that are associated with a piece of equipment, and
      e. be complete with respect to quantities, dimensions, specific performance, materials, and similar data to enable Engineer to review the proposed equipment.
   2. Omission by Contractor of any of the above requirements for submittals will subject submittal to automatic rejection without review.
   3. Any submittals received by Engineer that were not requested shall be returned without review of any kind.

E. Substitutions
   1. Reference Section 01 60 00.
   2. In Addition, no substitution is allowable without Engineer's written approval ten days prior to bid due date (unless otherwise allowed by Engineer) unless the manufacturer is listed on the Drawings or in the specifications as being a pre-approved alternative manufacturer. Any submittal received without such written approval or prior approval is subject to unqualified rejection.
   3. Contractor's responsibility shall be to verify that submitted substitute equipment will fit in the space available. The Contractor's submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the drawings or specifications. Any such changes shall be described in writing, briefly but completely.
   4. The Contractor shall be responsible for the cost of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The cost shall be complete, that is, it shall include the costs affect on any and all other trades.
   5. The Engineer may request shop drawings of mechanical rooms or systems of the substituted equipment.

F. Installation Instructions
   1. For certain products or systems as identified in subsequent specification sections, the Contractor shall, as required, provide copies of manufacturer's installation instructions with the submittal. When required as such, the installation instructions are considered part of the submittal and their omission may result in automatic rejection of the submittal. Where more than one identical devices are scheduled, only one set of installation instructions needs to be submitted, e.g. if seven five-ton split system air conditioners are

scheduled, only one five-ton unit installation instructions needs to be submitted. Similarly, if one set of installation instructions is identified by the manufacturer and on the instructions to be applicable to more than one type or size of devices, e.g. if one set of air conditioner instructions is good for three, four, and five-ton units, then only one instruction set is required for those devices.

2.2 MATERIALS

A. All materials shall be new and of the quality specified. Materials shall be free from defects. Where manufacturers' names are mentioned in these specifications or on the plans, it has been done in order to establish a standard of quality and construction.

B. Contractor will be responsible for transportation of his materials to and on the job, and will be responsible for the storage and protection of his materials and work until the final acceptance of the job. At the end of each work day, each Contractor is responsible for covering or protecting his work or materials that may be susceptible to damage even if such damage is the result of unforeseen causes, e.g. an overnight thunderstorm. Failure to do so will be sufficient cause for rejection of any item in question, and any such item shall be replaced at Contractor's expense.

C. Contractor shall verify that all pieces of equipment will fit through available openings in building and that all equipment can be installed without modification of building structure.

2.3 LABELING

A. Each device for which an independent testing authority has established a standard shall have affixed a label indicating its compliance and listing. Such independent testing authorities shall include, but not be limited to, the following:

A.D.C.	Air Diffusion Council
A.G.A.	American Gas Association
A.M.C.A.	Air Movement and Control Association
A.N.S.I.	American National Standards Institute
A.R.I.	Air-Conditioning and Refrigeration Institute
A.S.H.R.A.E.	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
A.S.M.E.	American Society of Mechanical Engineers
A.S.P.E.	American Society of Plumbing Engineers
A.S.S.E.	American Society of Sanitary Engineers
A.S.T.M.	American Society for Testing and Materials
A.W.W.A.	American Water Works Association
C.T.I.	Cooling Tower Institute
F.M.	Factory Mutual
I.A.P.M.O.	International Association of Plumbing and Mechanical Officials
I.C.B.O.	International Conference of Building Officials
M.S.S.	Manufacturers Standardization Society of the Valve and Fittings Industry
N.A.P.H.C.C.	National Association of Plumbing, Heating, Cooling Contractors
N.B.S.	National Bureau of Standards
N.E.B.B.	National Environmental Balancing Bureau
N.E.C.	National Electric Code
N.E.M.A.	National Electrical Manufacturers Association
N.F.P.A.	National Fire Protection Association
N.R.C.A.	National Roofing Contractors Association
N.S.F.	National Sanitation Foundation
P.D.I.	Plumbing and Drainage Institute
S.B.C.C.I.	Southern Building Code Congress International
S.M.A.C.N.A.	Sheet Metal and Air Conditioning Contractors' National Association
T.I.M.A.	Thermal Insulation Manufacturers Association

U.L. Underwriters Laboratory

2.4 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Contractor shall prepare and provide four copies of operating and maintenance manuals. Contractor shall deliver these four bound sets to the Engineer for approval. Each manual shall be in a ring binder and shall be indexed with dividers for each section. Delivery of required documents is a condition of final acceptance.

B. Each manual shall contain at least the following:
   1. Certificates of acceptance from inspecting authorities,
   2. Waiver of all liens,
   3. For each piece of equipment:
      a. operating and safety instructions, service manuals, and parts lists applicable to each item of equipment furnished (Contractor shall clearly distinguish in the manual between information that pertains to the particular equipment and information which does not.),
      b. nameplate data and design parameters for equipment,
      c. name, phone number, and address of vendor, manufacturer's representative, and warrantee provider,
      d. start-up report, if applicable,
   4. copies of all shop drawings and as-built drawings (as-built drawings shall be on a reproducible vellum as produced by a xerox or photographic process),
   5. copies of all approved submittals,
   6. warranties with start dates and end dates for each piece of equipment and/or for each system (warranties shall begin on date of substantial completion and acceptance by Owner),
   7. names, phone numbers and addresses of all subcontractors, vendors, manufacturer's representatives, and warrantee providers,
   8. certification letter from each Contractor that each system furnished and installed by that Contractor and/or Subcontractors is started-up, balanced, adjusted and checked for proper operation in accordance with the intent of the contract documents, and
   9. acceptance letter from each Contractor with blanks for date of acceptance and date of expiration of warranties and guarantees.

2.5 TAGGING

A. Equipment to be Tagged: Each major piece of equipment discussed in the specifications or scheduled on the drawings shall have affixed a tag showing the name or function of that piece. The list of equipment to receive tags shall include, but not be limited to, the following:
   1. valves,
      a. tag shall indicate function such as "domestic cold water shut-off", "domestic hot water shut-off", "chilled water shut-off", etc.,
      b. tag may be attached with brass chain,
      c. exceptions that need no tag:
         (1) shut-off valves near to and serving only one device such as a plumbing fixture,
         (2) isolation valves located at or near the device being isolated,
   2. All piping shall be identified as specified elsewhere in these documents.
   3. All major pieces of equipment.
   4. Items which have no unique name, such as air devices, plumbing fixtures, lights, etc., need not have tags.

B. Tags
   1. Material - Tags shall be engraved plastic, brass, or anodized aluminum. Surface mounted tags shall have pressure sensitive adhesive backing. Tags for outdoor use shall be mounted with brass screws.

2. Lettering - Characters shall be minimum 1/4" in height and shall be of a contrasting color to the tag.
3. Installation - Surface mounted tags with adhesive backs shall be applied only to clean, dry surfaces. Adhesive tags shall not be applied to surfaces that are subject to condensation or excessive heat.

C. Alternatives
1. For larger equipment such as large air handlers, switchgear, etc., the use of manufactured stencils (2 inch characters) and spray paint (in contrasting color to equipment) is an acceptable alternative.
2. Individual adhesive letters are not acceptable.
3. Other alternatives are acceptable only by submitting samples or manufacturer's literature to Engineer and receiving written permission.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. The workmanship shall, in all respects, be of the highest grade, and all construction shall be done according to the best practices of the trade. Piping, ducting and conduit shall be concealed unless otherwise noted, and installed square to the building lines. Any work not meeting this requirement shall be replaced or rebuilt without extra expense to the Owner.

3.2 INTERIM CLEANING

A. The Contractor shall maintain the work area in a clean condition during the course of the work. All debris, scrap and surplus material shall be removed from the work area on a periodic basis with a minimum of at least once per day.

B. All stored material shall be support above floor level and be protected from becoming damaged or dirty.

C. All installed material shall have open ends closed and protected from entrance of foreign material during construction.

D. Prior to enclosing an area such as a ceiling or chase wall, the installed material and surrounding area shall be thoroughly cleaned. After removing loose material, the area shall be vacuum cleaned or blown out with a portable blower to remove dust from surfaces.

3.3 CUTTING, PATCHING, AND PENETRATIONS

A. No joists, beams, girders, columns, slabs, or other structural elements shall be cut, drilled, or altered in any way by the Contractor without first obtaining written permission and instructions from the Engineer.

B. Where cutting any non-structural element(s) of walls, floors or ceilings is necessary to permit the installation of any work under this contract, or to repair any defects that may appear up to the expiration of the guarantee, such cutting shall be done by Contractor with as little damage as reasonably possible to the element being cut, to adjacent elements, or to the work of other trades.

C. After the necessary work has been completed, the damage shall be repaired by the Contractor, who shall pay all costs of such cutting and patching. All patching or sealing of cuts, penetrations, etc., including final appearance of same, shall be done to the approval of the Engineer. In absence of specific finish instructions, provide finish to match adjacent surfaces.

D. Where a penetration or cutting of a ceiling, wall, or other building membrane is required or made, each such penetration or cut shall be made neatly with a cutting tool such as a saw, sharp knife, etc., and not with an impact tool such as a hammer, screwdriver, wrench, crowbar, etc. Each such penetration or cut shall be no larger than reasonably necessary, and penetrations in occupied or publicly accessible spaces shall have a chrome-plated escutcheon installed large enough to cover the entire opening.

E. Where a penetration is made in a fire-rated building assembly (wall, floor, ceiling, floor-ceiling, roof-ceiling, etc.) or in a membrane of a fire-rated assembly, and no specific firestopping assembly is shown on Drawings, Contractor shall provide and install a firestopping assembly or product as listed in the latest edition of U.L. Fire Resistance Directory. Firestopping assembly or product shall be appropriate for the size and material of the penetrating element, for the penetrated building element, for the presence or lack of insulation, for the size of the annulus around the penetrating element, etc.. Contractor shall include firestopping assembly or product in submittals. Contractor shall review and verify fire-ratings of building assemblies as shown on Architectural plans. Lack of knowledge of a fire-rating of an building assembly shall not relieve Contractor of requirement to install firestopping.

3.4 EQUIPMENT AND PIPING SUPPORTS

A. All supporting systems for piping, equipment, and materials supported by the building structure shall be submitted to the Engineer for approval prior to purchase and installation.

B. Provide 3-1/2” (minimum, or as called out elsewhere) high concrete house keeping pads for all floor mounted equipment piping. Pad shall have chamfered edges and be painted to match the floor.

3.5 ACCESSIBILITY

A. Access Panels
   1. Access panels shall be provided wherever necessary for possible future replacement, adjustment, or maintenance of operating devices such as machinery, valves, dampers, switches, relays, etc., or to other critical non-operating devices such as pull boxes, inspection parts, gauges, etc. Such access panels shall be provided and installed by Contractor, whether or not shown on drawings, and shall be brought to the attention of Engineer for his approval of type, color, etc. Where access is provided in rated members, the access panels shall be of a type that maintains the integrity of the member penetrated.

B. Access to Equipment
   1. All pipes, tubing, conduit, etc., including, but not limited to, chilled water and heating water piping, domestic cold water and hot water piping, fire sprinkler piping, waste and vent piping, drain piping of any type, electrical conduit, wiring not in conduit, and pneumatic control tubing shall be installed in such a way so as not to prevent and/or not to make unreasonably difficult the removal, operation, use, or maintenance of equipment, access panels or doors, pathways (especially in attics or crawl spaces), observation ports, measurement or balancing devices, junction boxes, etc.. If access for these purposes is prevented or made unreasonably difficult in the opinion of the Engineer, then the Contractor shall make modifications or repairs at no cost to anyone except the Contractor. Such modifications or repairs shall be considered neither complete nor adequate until the Engineer are satisfied that access for the above purposes is achieved.

3.6 FIELD REPORTS

A. The Contractor shall be required to respond all deficiency items noted in Field, Site Visit, Punch List and other such reports provided by the A/E. The response shall address each

deficiency item in the same order as the report with annotations as to what was done to remedy the deficiency, who performed the work and when it was done.

3.7 OPERATING TESTS

A. General
   1. After all mechanical and electrical systems have been completed and put into operation, Contractor shall subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation. All associated costs of such tests, including labor, fuel, apparatuses, piping, etc., shall be borne by the Contractor.
   2. Contractor shall make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. The Contractor shall return to the project during the first year and in the opposite season from which the system was initially operated and shall check the proper operation of the mechanical and electrical systems. Contractor shall perform any adjustments or corrective procedures required for the proper operation of all systems.

B. Notification
   1. Contractor shall give the Engineer seven days' prior notification of any test so that the Engineer will have time to be present if he so desires.

C. Reports
   1. After each test is performed, the Contractor who performed the test shall prepare and issue a report to include the following information:

      a. Project name and location, date of the report,
      b. Contractor's name, address, and telephone number; if the Contractor performing the test is a Subcontractor, indicate also for whom the test is being performed, their name, address, telephone number, and a contact person's name,
      c. the date, or range of dates, of the test,
      d. the name of the Contractor's employee who was responsible for performing or for overseeing the performing of the test,
      e. a brief description of the system being tested,
      f. a brief description of the testing procedure,
      g. a summary of the test result(s),
      h. a brief assertion that the system was tested as stated and that the system complied with the requirements of the contract documents or those of the Authority Having Jurisdiction, whichever is the most stringent, and
      i. a hand-written date and signature of someone who has authority or responsibility from the company that performed test(s), and a hand-written brief note stating that the above information is true and accurate.
   2. If the tested system is tested in parts, then one report may be made after the last part is tested.
   3. The report shall be issued to the Engineer within five working days after the test is completed.
   4. Such reports shall be required of all mechanical or electrical systems which require tests for pressure, water tightness, flow, resistance, or conductivity.

D. Services of a Manufacturer's Representative
   1. Reports: For all major systems or equipment required by subsequent specifications sections to have tests or inspections by a manufacturer's representative, the manufacturer's representative shall prepare a written report to be sent to the Engineer for subsequent distribution to the Engineer, Owner, General Contractor, and to whomever else the Engineer deems necessary. The report shall include at least the following:
      a. date of the visit, name and title of the representative, name and location of the project,

b. name and title of any observers,
c. a brief description of the equipment being inspected and/or tested,
d. a brief discussion of the quality of the installation including any important items (in the manufacturer's experience) that were done correctly, as well as any items that were done incorrectly or not to recommendations,
e. a list of tests and/or inspections performed and the results of same, and
f. a brief statement of whether the installation conforms to manufacturer's recommendations and/or requirements, and if not what is required to bring the installation into conformance.

2. Deficiencies and Defects
   a. Contractor shall be responsible for providing all labor and materials, at no cost to anyone except Contractor, to correct any deficiencies or defects reported by manufacturer's representative.
   b. If, in the opinion of the manufacturer's representative, the deficiencies and defects are sufficiently serious, then Contractor shall arrange for, and bear all costs of, another inspection by manufacturer's representative after corrective measures have been taken.
3. The above process shall continue until the manufacturer's representative approves the installation.

3.8 INSTRUCTIONS FOR OWNER

A. Contractor shall instruct the Owner's operating personnel in the operation and maintenance of all mechanical equipment. Contractor shall furnish any special servicing tools required for maintenance.

3.9 DEMONSTRATION

A. Contractor shall conduct a demonstration of the installation upon completion of the work. Prior to this, all work shall have been completed, tested, balanced, and placed in operation. Qualified persons must be present at demonstration to operate all systems and prove the performance of the equipment. The schedule for this demonstration shall be coordinated with the Engineer.

3.10 CLEANUP

A. At substantial completion of the project, thoroughly clean all equipment and systems of all dirt, debris and foreign material.

B. This shall include cleaning coils and fans inside of air handlers, cleaning the interior of duct systems and wiping down the interior of all electrical equipment.

END OF SECTION

SECTION 22 05 05

PIPES, FITTINGS AND VALVES FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Section Includes: Pipe and pipe fittings for the following systems:
1. Domestic water piping within 5 feet of building
2. Sanitary sewer piping within 5 feet of building
3. Valves
4. Water hammer arrestors
5. Escutcheons
6. Unions and flanges
7. Identification

1.2 REFERENCES

A. Codes: Provide plumbing piping systems laid out and installed in accordance with the local plumbing codes.

B. Standards: Where national or industry standards are referenced, provide materials and equipment certified by the manufacturer to be in conformance with latest issue of such national standards. Conform to the following standards:

1. American National Standards Institute (ANSI):
   a. A112.21.1M Floor Drains
   b. A112.21.2M Roof Drains
   c. A112.36.2 Cleanouts
   d. B16.12 Cast Iron Threaded Drainage Fittings
   e. B16.18 Cast Copper Alloy Solder Joint Pressure Fittings
   f. B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
   g. B16.23 Cast Copper Alloy Solder Joint Drainage Fittings
   h. B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings
   i. B16.32 Cast Copper Alloy Solder Joint Fittings for Solvent Drainage Systems
   j. B31.3 Chemical Plant and Petroleum Refinery Piping,
2. American Society for Testing and Materials (ASTM):
   a. A 47 Standard Specification for Ferritic Malleable Iron Castings
   b. A 53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded Seamless
   c. A 74 Standard Specification for Cast Iron Soil Pipe Fittings
   d. A 183 Standard Specification for Carbon Steel Track Bolts and Nuts
   e. A 216/A 216M Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding for High-Temperature Service
   f. A 276 Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes
   g. A 307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
   h. A 536 Standard Specifications for Ductile Iron Castings
   i. B 32 Standard Specification for Solder Metal

j. B 43 Standard Specification for Seamless Red Brass Pipe, Standard Sizes
k. B 61 Standard Specification for Steam or Valve Bronze Castings
l. B 62 Standard Specification for Composition Bronze or Ounce Metal Castings
m. B 75 Standard Specification for Seamless Copper Tube
n. B 88 Standard Specification for Seamless Copper Water Tube
o. B 306 Standard Specification for Copper Drainage Tube (DWV)
p. B 584 Standard Specification for Copper Alloy Sand Castings for General Applications
q. C 62 Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale)
r. C 478 Standard Specification for Precast Reinforced Concrete Manhole Sections
s. C 564 Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
t. D 1785 Standard Specification for PVC Plastic Pipe, SCH 40, 80, and 120
u. D 2000 Standard Classification System for Rubber Products in Automotive Applications
v. D 2467 Standard Specification for PVC Plastic Pipe Fittings

3. American Water Works Association (AWWA):
   a. C111/A21.11 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
   b. C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in., for Water and Other Liquids
   c. C606 Grooved and Shouldered Joints
4. Cast Iron Soil Pipe Institute (CISPI):
   a. 301 Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
   b. 310 Patented Joint for Use in Connection with Hubless Cast-Iron Sanitary System
5. Federal Specifications (FS):
   a. RR-F-621 Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole
6. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS):
   a. SP 70 Cast Iron Gate Valves, Flanged and Threaded Ends
   b. SP 71 Cast Iron Swing Check Valves, Flanged and Threaded Ends
   c. SP 80 Bronze Gate, Globe, Angle and Check Valves
   d. SP 84 Steel Valves - Socket Welding and Threaded Ends
   e. SP 85 Cast Iron Globe and Angle Valves Flanged and Threaded Ends
7. Plumbing and Drainage Institute (PDI):
   a. G101 Testing and Rating Procedure for Grease Interceptors
   b. WH201 Water Hammer Arrestors

1.3 SUBMITTAL

A. Manufacturer's Data: Submit standard manufacturer's published product literature for materials and equipment proposed for use under this Contract, including the following items:
   1. Fixtures – all types
   2. Soil pipe and fittings.
   3. Domestic water pipe and fittings.
   4. Drainage piping and fittings.
   5. Jointing methods and materials for all piping systems.
   6. Valves - all types.

7. Traps - all types.
8. Water hammer arrestors.
9. Access panels.
10. Identification products
11. Hanger and support products

1.4 DELIVERY, STORAGE AND HANDLING

A. Furnish piping with temporary inlet and outlet caps until installation.

B. Store materials material in dry location elevated above floor and protected from entry of debris, dirt and mud

PART 2 - PRODUCTS

2.1 GENERAL

A. Piping materials shall be in conformance with details shown on the Drawings or as specified in the Pipe Specifications in this Section. Valves shall be as specified or approved equivalents. Unless otherwise specified, valve packing shall be the manufacturer's standard for the intended service.

B. Close or butt nipples and bushings are not permitted.

C. Pipe size changes shall be made with bell reducers.

D. Bullhead or splitter tees are not permitted.

2.2 PIPING MATERIALS

A. Domestic Water
1. General - No water piping shall be smaller than 3/4" except at points of connections to individual fixtures or if shown otherwise.
2. Type "L" hard drawn copper pipe with solder type wrought copper joined with 95/5 solder or Pro-Press fittings.

B. Condensate Drain - Type M hard copper with solder type wrought copper or Pro-Press fittings.

C. Sanitary, Waste, Drain, Vent And Storm Drain Piping

1. Soil Pipe Above Ground:

a. 3 inch diameter and larger: Standard weight cast iron pipe with cast iron hubless pipe and fittings with CISPI 301 fittings and CISPI 310 coupling joints.
b. 2-1/2 Inches and Smaller: Cast iron or copper waste lines.
(1) Do not use copper for urinals.
c. Provide cast iron hubless pipe and fittings conforming to CISPI 301 with CISPI 310 coupling joints.
d. Provide ASTM B 306 copper tubing with ANSI B16.23, ANSI B16.29 or ANSI B16.32 solder joint fittings using ASTM B 32 lead free solder.

2. Soil Pipe, Below Surface:
a. Schedule 40 PVC (solid wall pipe) ASTM D1785 with solvent joint DWV fittings. Foam Core pipe is unacceptable.
b. Any drainage fixture that may accept hot fluid greater than 130 degrees F. shall be cast iron for the first 10'-0" beyond the inlet. This includes drainage fixtures for steam condensate, water heater and boiler temperature or pressure reliefs and circulating

heating (hydronic) water relief valves.

2.3 VALVES

A. General
   1. All valves installed in pipes that are to receive insulation shall have provisions to accommodate the insulation, such as extended length bonnets or handles, without compromising the insulation in anyway (such as reducing its thickness, compressing it, etc.).

B. Plumbing
   1. Shut-off - Apollo, Hammond, Jomar, Nibco, Watts, or approved equivalent
      a. Up through 2" - Ball valve, two-piece brass body, chrome-plated ball with brass stem, threaded connections, full port, Apollo 77-100, Hammond 8301, Jomar T-100, Nibco T-585-70, Watts B-6080
      b. 3” through 4" - Ball valve, brass body, full port, chrome-plated ball with brass stem, Fed. Spec. WWV-35B, Jomar T-100-711 or approved equivalent
   2. Check
      a. Up through 2" - in-line, spring loaded, bronze body, threaded with thread-to-sweat adapter, Nibco T-480-Y, Watts 600
      b. 2-1/2” and up - spring loaded wafer check, iron body, bronze mounted, flanged ends, aluminum bronze disc, EPDM seats, stainless steel spring and hinge pin, Stockham WG-970, Nibco W-920-W

2.4 WATER HAMMER ARRESTORS

A. Provide water hammer arrestors that are listed and in compliance with Plumbing & Drainage Institute Standard PDI-WH 201, latest edition.

2.5 ESCUTCHEON PLATES

A. Contractor shall provide and install escutcheons around all pipes passing through walls, ceilings, cabinets, and floors in finished areas. Escutcheon shall be chrome-plated cast brass with set screw.

B. Caulk escutcheons to surface with appropriate material of a color to match surface finish.

2.6 UNIONS

A. Contractor shall provide and install unions for piping connections on each side of all equipment, control valves and at other points where shown on the Drawings. Unions shall be flanged or 150 pound malleable iron with ground bronze seat. Dielectric unions shall isolate dissimilar metals (e.g., copper and ferrous piping) and shall be equal or equivalent to WATTS Series 3000. All valves with threaded connections, regardless of size, shall have as a minimum one union near to one size of the valve.

2.7 IDENTIFICATION AND DETECTION

A. Above Ground
   1. General - Pipes to be identified shall include domestic cold, hot water supply and return, and HVAC heating water. Indicate flow direction at each marker.
   2. Pipes shall be identified by marker bands that conform to ANSI A13.1-1981 requirements as to color of background and characters, and to character size and marker length as shown below:

Fits Pipe O.D., in.	3/4” to 1”	1-1/8” to 2-3/8”	2-1/2” to 3-1/4”	3-3/8” to 4-1/2”	4-5/8” to 7-7/8”	8” to 10”
Letter Height	½”	¾”	1-1/4”	1-1/4”	1-1/4”	2-1/2”
Length of Color Field, in.	8”	8”	12”	12”	12”	24”

*O.D. includes insulation

a. Markers shall have arrows indicating direction of flow. Markers shall have integral ultraviolet inhibitors.
b. Pipe O.D. Less Than 6 Inches
c. Markers shall be one-piece wrap-around snap-on type of the correct size to grip the pipe (or insulation) firmly enough to prevent slippage, even when installed on a vertical pipe. Product shall be Seton "Setmark" type SNA, Bradysnap-on B-915, or approved equal.
d. Pipe O.D. 6 Inches or More
e. Markers shall be preformed to fit the pipe size, and they shall be secured by stainless steel spring fasteners. Marker and spring fasteners shall be of correct size to grip pipe firmly without slippage even when installed on a vertical pipe, but not so tight as to cut through vapor barrier or service jacket. Product shall be Seton "Setmark" type STR or approved equal.
f. Installation
   (1) Markers shall be installed not more than 20 feet apart, on both sides of a wall where a pipe penetrates (unless underground), at least once in every room, and at every tee connection other than direct equipment connections.

PART 3 - EXECUTION

3.1 FABRICATION AND INSTALLATION OF PIPING

A. General
1. All piping systems shall be kept clean during all phases of the work. Once fabrication has started on any length of pipe, the open ends of piping shall be kept plugged or capped when erection is not in progress to prevent the entry of dirt and other foreign material. The ends of spare lines shall be left capped or blind flanged when erection has been completed.
2. Reports for operating tests, as described herein, shall be prepared and issued in conformance with the requirements of Section 22 01 00. Similar reports shall additionally be prepared and issued for procedures of cleaning, flushing, chemical treatment, and disinfection, on any system including, but not limited to, domestic water lines, gas lines, and circulating water systems.
3. Piping systems shall be fabricated and installed in accordance with ANSI B31.1. The sizes, locations and slopes shall be as shown on the Drawings or as required by this Specification.
4. All piping systems that are not concealed, covered with insulation or otherwise exposed to view either inside or outside of the building shall be painted in accordance with the architectural painting specifications.

B. Threaded Systems
1. Burrs shall be removed from mating threads in threaded piping before assembly. Pipe shall be reamed to the nominal inside diameter after cutting. Inner surfaces of all pipes, valves,

and fittings shall be smooth, clean and free from metal chips, sand, debris and dirt when erected.
2. All joints in threaded piping systems shall be made with Teflon Tape or joint sealant of the non-toxic type. Tape or sealant shall be applied to male threads only.

C. Soldered Systems
1. In general, soldered piping systems shall conform to IAPMO Standard IS-3-89.
2. Copper tubing shall be accurately measured to reach all the way into each socket without being too long so as to cause strain on the system.
3. Copper tubing shall be cut square using a wheel cutter only.
4. After cutting, both inside and outside of copper tubing shall be thoroughly reamed to remove burrs using a cone type deburring tool so that interior bore of piping is completely smooth without ridge.
5. The outside of copper tubing and the inside of each socket shall be cleaned by lightly abrading with a sand cloth, abrasive pads, or properly sized fitting brush.
6. Oxides shall be removed from the cleaned surfaces by applying a thin, even coating of flux that is compatible with the solder.
7. Fitting shall be preassembled and excess flux shall be removed.
8. Heat shall be applied to the fitting and precautions shall be taken to protect adjacent combustible materials from scorching or ignition. A protective device such as Flame-Gard by Atlanta Special Products or equivalent shall be employed where needed. A flame shall not be directed into the fitting socket.
9. When fitting is hot enough, solder shall be applied beginning slightly off-center at the bottom of the joint and then across the bottom and up to the top center. Then returning to the beginning, solder shall be applied overlapping the starting point and up the uncompleted side to the top, overlapping again.
10. Joint shall be allowed to cool naturally. Shock cooling by immersion in water or otherwise in not permitted.

D. Mechanical Joint Systems in Metallic Pipe
1. Pipe shall be prepared in accordance with manufacturers written instructions. Cutting and/or grooving tools shall be used as provided by the manufacturer of the fittings.
2. Pipe shall be sufficiently free of indentations, projections, grooves, weld seams, or roll marks on the exterior over the entire gasket seating area to ensure a leak-tight seal.
3. Gaskets shall be checked to verify that they are suited for the intended service.
4. Lubrication shall always be applied to the gasket exterior including the lips and/or pipe ends and housing interiors to prevent pinching of the gasket.
5. Fitting shall be applied without pinching, twisting, or otherwise deforming the gasket, and the retaining bolts shall be tightened down to manufacturer's recommended torques.
6. Contractor shall support and anchor mechanical joint piping systems in accordance with manufacturer's instructions.

3.2 VALVES

A. Valves, accessories and equipment shall be installed as shown on the Drawings. Install valves with stems upright or horizontal, not inverted.

B. Locations of valves as shown on Drawings are approximate. Each valve shall be installed so that adjacent piping or equipment will not interfere with:
1. access to and operation of the valve operating mechanism, or
2. access to and use of auxiliary devices such as pressure and/or temperature ports.

C. Valves shall receive identification tags.

3.3 WATER HAMMER ARRESTORS

A. Install in compliance with Standard PDI-WH 201.

B. Provide water hammer arrestors as shown on the drawings and where necessary to stop water hammering of domestic water lines from fast closing valves.

C. Provide isolation ball valve at each water hammer arrestor.

3.4 GAUGES

A. Unless shown otherwise, gauges shall be installed complete with 1/4" ball type isolation valve (as required) and 1/4" NPT brass tubing.

3.5 ACCESSIBILITY

A. Contractor shall provide and install access panels where required by Codes or for easy access to any above floor service such as valves which may normally require maintenance. Access panel shall be submitted to Architect for approval, but in general, the panel shall be square, either stainless steel, chrome-plated bronze, or prime coated as preferred by Architect, large enough to permit service of the device, either flush or face-of-wall mounting as preferred by Architect, with anchoring method appropriate for the wall into which it is to be installed, and secured with vandal-proof screws. Product shall be Jay R. Smith 4730 or 4735, Karp Type DSC, or approved equivalent.

3.6 TESTING AND ADJUSTING

A. General
   1. No plumbing or drainage system or building sewer shall be covered or put into use until it has been tested, inspected, and accepted as prescribed by Code or herein.
   2. Administrative Authority
      a. The Contractor doing the work is responsible for determining who the Administrative Authority is for his work and for obtaining permits and for arranging required tests and inspections. Before requesting observation of a test by anyone, that the system will pass the prescribed test(s). Notify the General Contractor and the Architect that the preliminary tests have been performed, that system passed the tests, and that Contractor is ready to notify Administrative Authority. Architect shall have the authority to require that the test(s) be replicated in the presence of himself and/or the Engineer. Contractor shall receive Architect's approval before notifying Administrative Authority of readiness for testing.
      b. Notify Administrative Authority that work is ready for inspection. Contractor shall notify Architect as to date and time of test(s) so that he and/or Engineer may be present if needed.
      c. The above process shall be continued until the system is approved by the Administrative Authority.
   3. Costs
      a. Any equipment, material, and/or labor necessary for tests or inspections shall be furnished by the Contractor as part of this Contract at no cost to anyone else but the Contractor.
      b. Any required repairs, corrections, or modifications, including equipment, materials, and/or labor, shall be provided or performed by the Contractor at no cost to anyone else but the Contractor.
   4. Prepare and provide reports per "OPERATING TESTS" in Specifications Section 15010.

B. DOMESTIC WATER

1. Leak Testing
    a. Test domestic water system, including cold water and hot water supply and return piping for leaks as follows:
        (1) Cap all piping at final connections to fixtures and equipment.
        (2) Test hydrostatically at a pressure of 150 psig maintained for 6 hours.
        (3) If, after test duration period, a drop of more than 3 psig is observed, make required corrections to defective portions of the system and repeat test procedure until system is proved tight.
        (4) Remove caps from piping and make final connections to fixtures and equipment.
        (5) Visually inspect connections to fixtures and equipment for a period of 12 hours when entire system is put into operation at line pressure and make any necessary repairs.
2. Cleaning and Disinfecting
    a. Thoroughly flush cold and hot domestic water piping with water to remove all foreign particles.
    b. Sterilize the lines by filling the system with a solution of chlorine containing 50 ppm of chlorine. Solution shall be made from pure calcium hypochlorite with no trace elements or compounds. The solution shall stay in the line for a minimum period of 24 hours during which time each valve shall be opened and closed several times in order that all parts of the valve shall be in contact with the solution.
    c. After the sterilization period, drain, thoroughly flush the system with clean potable water, and perform potability tests as described.
3. Potability Testing
    a. After disinfecting and flushing the system, perform, or have performed, tests as described below.
        (1) On-Site Chemical Testing
            (a) Obtain chlorine test kits, each of which shall consist of a container for the sample, a color-forming reagent, and a color comparison chart. Kit shall be Hach Colormetric, Chemetrics 'CHEMets', or equivalent.
            (b) At each water outlet, including but not necessarily limited to, sinks, lavatories, drinking fountains, water coolers, hose bibbs, showers, and hydrants, where a person could drink from or be exposed to domestic water, perform an on-site chlorine test using the test apparatus described above. At each test location, chlorine level shall indicate to be 0.2 ppm or less or, alternatively, no greater than the incoming chlorine concentration from the water utility.
        (2) Laboratory Biological Tests
            (a) Obtain a 'WATER BACTERIOLOGY' testing kit from the State Health Department Laboratory. Water testing kit consists of a plastic sample bag, a sodium thiosulfate tablet inside the bag, and a set of printed instructions.
            (b) Follow the printed instructions which generally tell where and how to take the sample, how to treat the sample, and what to do with the sample. Send or take the sample per instructions to the nearest State approved laboratory. NOTE: Sample must be received by the laboratory within 30 hours of the time the sample was taken or the results will be unsuitable for analysis. In such an event, repeat the procedure until a suitable sample is received by the

laboratory.

4. Tags
   a. Remove 'nonpotable' tags on plumbing fixtures (that were installed earlier in the project) but only after water system is subjected to disinfection procedures and passes tests described above.
5. Reports
   a. Prepare and provide written reports and/or test results at each stage of testing as described above.

C. HOT WATER RETURN
1. Balance domestic hot water return system so that hot water is readily available at all fixtures and equipment and that flow is assured and demonstrable at the end of each circulating line.

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe hangers and supports.
2. Hanger rods.
3. Formed steel channel.
4. Firestopping relating to Plumbing work.
5. Firestopping accessories.

1.2 REFERENCES

A. American Society of Mechanical Engineers:
1. ASME B31.1 - Power Piping.
2. ASME B31.5 - Refrigeration Piping.
3. ASME B31.9 - Building Services Piping.

B. ASTM International:
1. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.
4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
5. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

C. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.

D. FM Global:
1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

E. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

F. Underwriters Laboratories Inc.:
1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
5. UL - Fire Resistance Directory.

G. Intertek Testing Services (Warnock Hersey Listed):
   1. WH - Certification Listings.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction. Install in strict accordance with manufacturers listing instructions.

1.4 SUBMITTALS

A. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.

B. Product Data:
   1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
   2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

C. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.

D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Manufacturer's Installation Instructions:
   1. Hangers and Supports: Submit special procedures and assembly of components.
   2. Firestopping: Submit preparation and installation instructions.

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

G. Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
1. Carpenter & Paterson Inc.
2. Creative Systems Inc.
3. Flex-Weld, Inc.
4. Globe Pipe Hanger Products Inc.
5. Michigan Hanger Co.
6. Superior Valve Co.
7. Fee and Mason.
8. B-Line.
9. Grinnell
10. Portable Pipe Hanger

B. Piping:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
7. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hooks.
8. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
9. Wall Support for Hot Pipe Sizes 6 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
10. Vertical Support: Steel riser clamp.
11. Roof Support for Pipe Sizes 2 inches and Smaller: Polypropylene (UV Stabilized) Pad type support with adjustable height hot dipped galvanized formed steel channel support. Portable Pipe Hanger SS8-C or similar. Secure pad to roof with mastic compatible with roofing system (verify with roof material supplier). Clamp piping to channel.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Copper Pipe Support: Copper-plated, carbon steel ring.

2.2 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

B. Insulated piping: Reference insulation specifications.

2.3 FORMED STEEL CHANNEL

A. Manufacturers:

1. Allied Tube & Conduit Corp.
2. B-Line Systems
3. Midland Ross Corporation, Electrical Products Division.
4. Unistrut Corp.
5. Powerstrut
6. Kindorf

B. Product Description: 12 gage thick steel, pre-galvanized prior to roll forming, G90 zinc weight conforming to ASTM A653. With holes 1-1/2 inches on center.

C. All channels, bolts, nuts, washers, rods and other fittings used on fabrications exterior to the building shall be hot-dipped galvanized finish – ASTM A123 or A153.

2.4 FIRESTOPPING

A. Manufacturers:
1. Dow Corning Corp.
2. Fire Trak Corp.
3. Hilti Corp.
4. International Protective Coating Corp.
5. 3M fire Protection Products.
6. Specified Technology, Inc.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Single component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

2.5 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:
1. Mineral fiberboard.
2. Mineral fiber matting.
3. Sheet metal.
4. Plywood or particle board.
5. Alumina silicate fire board.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:
1. Furnish UL listed products or products tested by independent testing laboratory.
2. Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:
1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install backing and damming materials to arrest liquid material leakage.

D. Obtain permission from Engineer before using powder-actuated anchors.

E. Do not drill or cut structural members.

3.3 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Install in accordance with ASME B31.1, ASME B31.5, and ASME B31.9.

B. Support horizontal piping as scheduled.

C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

D. Place hangers within 12 inches of each horizontal elbow.

E. Use hangers with 1-1/2 inch minimum vertical adjustment.

F. Support vertical piping at every floor.

G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 07 00.

M. Cut off hanger rods to within 1 inch of support. Finish exposed rods with acorn nut.

N. Coat cut ends of galvanized channel and hardware used exterior of the building with zinc-rich paint such as ColdGalv or similar.

O. Roof piping support: Provide polycarbonate pillow-block type such as Miro Products Model 1.5.

3.4 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating in accordance with the product listing.

D. Non-Rated Surfaces:
   1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof opening as follows:
      a. Install sleeve through opening and extending beyond minimum of 1 inch (25 mm) on both sides of building element.
      b. Size sleeve allowing minimum of 1 inch (25 mm) void between sleeve and building element.
      c. Install type of firestopping material recommended by manufacturer.
   2. Install escutcheons where pipe, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
   3. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.
   4. Interior partitions: Seal pipe penetrations at clean rooms, laboratories, medical spaces, computer rooms, telecommunication rooms, and data equipment rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and pipe.

3.5 FIELD QUALITY CONTROL

A. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.6 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.7 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

3.8 SCHEDULES

A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches (mm)	COPPER TUBING MAXIMUM HANGER SPACING Feet (m)	STEEL PIPE MAXIMUM HANGER SPACING Feet (m)	COPPER TUBING HANGER ROD DIAMETER Inches (mm)	STEEL PIPE HANGER ROD DIAMETER Inches (mm)
1/2 (12)	5 (1.5)	7 (2.1)	3/8 (9)	3/8 (9)
3/4 (20)	5 (1.5)	7 (2.1)	3/8 (9)	3/8 (9)
1 (25)	6 (1.8)	7 (2.1)	3/8 (9)	3/8 (9)
1-1/4 (32)	7 (2.1)	7 (2.1)	3/8 (9)	3/8 (9)
1-1/2 (38)	8 (2.4)	9 (2.7)	3/8 (9)	3/8 (9)
2 (50)	8 (2.4)	10 (3)	3/8 (9)	3/8 (9)
2-1/2 (65) (Note 2)	9 (2.7)	11 (3.4)	1/2 (13)	1/2 (13)
3 (75)	10 (3)	12 (3.7)	1/2 (13)	1/2 (13)
4 (100)	12 (3.7)	14 (4.3)	1/2 (13)	5/8 (15)

B. Refer to manufacturer’s recommendations for grooved end piping systems.

C. Refer to manufacturer’s recommendations for PVC, CPVC and other piping materials.

D. 20 feet maximum spacing, minimum of one hanger for each pipe section close to joint behind bell. Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller, subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for water service steel pipe.

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 – GENERAL

1.1 SCOPE

A. Furnish all labor and materials necessary for the complete installation of thermal insulation on all hot and cold surfaces which require insulation for heat or cold conservation, comfort and safety of occupants, efficiency or ease of operation, or to prevent condensation or dripping. The insulation shall be complete and effective throughout the building.

B. Section Includes:
   1. Piping system insulation.
   2. Pipe insulation jackets.
   3. Insulation accessories including vapor retarders and accessories.

C. All work shall be performed in a neat and professional manner by a Contractor or Subcontractor regularly engaged in the insulation field. The Mechanical Contractor shall be responsible for the bidding and execution of this work.

D. Any equipment or devices mentioned specifically in this section or any equipment or devices installed by the Mechanical Contractor that can have or cause temperatures low enough to cause condensation shall be adequately insulated and vapor sealed. If equipment, devices, or required insulation product is not specifically mentioned in this section or shown on drawings, the Contractor is required to request and obtain written instructions from the Engineer. If condensation should occur due to inadequate or missing insulation and/or vapor sealing, such damage, including damage to other affected property or building elements, shall be repaired by Contractor at no cost to the Owner.

1.2 GENERAL REQUIREMENTS

A. All insulation inside the building shall have composite (insulation, jacket or facing, and adhesive or cement used to adhere the jacket to the insulation) flame-spread rating of 25 or less and smoke-developed rating of 50 or less as tested under procedure ASTM E-84 and NFPA 255.
   1. Insulation with a less stringent flame and smoke rating may be used only with the written permission of the Engineer.
   2. Insulation products that meet the 25/50 rating requirement but that melt and drip flammable products, such as closed cell polyethylene products, are not acceptable.

B. Accessories such as adhesive, mastics, cements, and cloth for fittings shall be permanently fire and smoke resistant. Chemicals used for treating paper in jacket laminates shall be unaffected by water or humidity.

C. All adhesives, sealers, vapor barrier coatings, etc., shall be compatible with materials to which they are applied and shall not corrode, soften, or attack such materials in either the wet or dry state. Unless otherwise approved, all adhesives, sealers, coatings, mastics, etc., shall be water based.

D. Any insulation product found to be damaged or has become wet, whether installed or stored, shall be immediately removed and replaced with new product.

E. Thermal insulation shall be applied where needed, including but not limited to the following systems, as described herein:
   1. Domestic Cold Water, Hot Water Supply and Return,
   2. Condensate Drainage

PART 2 - PRODUCTS

2.1 PIPING INSULATION

A. General
   1. Insulation shall be one piece molded fiberglass with a factory applied all service vapor barrier jacket composed of kraft-reinforced foil. Insulation, with or without jacket, shall meet the requirements of ASTM C547, Class 1 and 2. Composite shall be rated by the manufacturer for use on hot or cold surfaces, either exposed or concealed, from -20 to +450 degrees F. Jacket shall conform to ASTM E96 with a permeability not exceeding 0.02 perms. Insulation shrinkage shall be less than 0.5% per ASTM C356. The insulation shall be sized by the manufacturer and correctly provided and installed by the Contractor to fit both the nominal pipe size and also the pipe material, i.e. ferrous versus non-ferrous. Thermal conductivity shall be no greater than 0.27 BTU in./hr/sq. ft./deg. F at a mean temperature of 75 degrees F. Jacket sealing system shall be a self-sealing lap type with pressure-sensitive adhesive. Product shall be Certainteed Snap*Form, Knauf Pipe Insulation, Manville Micro-Lok, Owens/Corning SSL-II or approved equivalent.
   2. Fittings, including but not limited to, short and long radius ells, tees, reducers, traps, valves, (except HVAC control valve) shall be insulated with factory made, one-piece, pre-molded high impact PVC covers with pre-cut fiberglass insulation inserts. Acceptable products are Snap*Form by Certainteed, Knauf Fitting Cover System, Zeston 2000 by Manville, or approved equivalent.

B. Thickness
   1. Piping Indoors

Service	Pipe Size	Min. Thickness
Hot	1-1/4" and smaller	1 inch
Cold	all sizes	½ inch

C. Closed Cell Insulation
   1. For cold condensate copper drain lines, a flexible, closed-cell, elastomeric insulation shall be used according to the following schedule:

Service	Pipe Size	Min. Thickness
Cold Condensate	all sizes	1/2 inch

   2. Insulation shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less as tested by ASTM E84-84A. Insulation shall be in a tubing form, both factory fabricated and also provided and installed correctly by the Contractor for the size and material of the pipe to which it is to be applied. Such insulation in a tape form is not acceptable. Product shall be ARMAFLEX by Armstrong or approved equivalent.

2.2 EQUIPMENT

A. All equipment shall be factory insulated where specified. All equipment installed in a duct downstream of a cooling coil, for example, a hot water heating coil, a duct furnace, etc.,

shall have insulation equal to external duct insulation applied to prevent condensation. Alternatively, a closed cell elastomeric insulation in sheet form such as ARMAFLEX may be used in strict conformance with manufacturer's written instructions and these specifications.

PART 3 - EXECUTION

3.1 PIPING INSULATION INSTALLATION

A. General

1. All insulation shall be continuous through wall and ceiling openings and sleeves. Insulation on all cold surfaces, where vapor barrier jackets are used must be applied with a continuous unbroken vapor seal. Hangers, supports, anchor, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation. Where insulation is discontinued, special care shall be taken to taper the insulation to the pipe to allow for vapor barrier to completely seal off end of the insulation.
2. Insulation shall be applied after the surfaces have been thoroughly cleaned and dry and all piping has been tested and proven tight.
3. Circumferential self-sealing strips shall be applied to all butt joints to form a positive closure.
4. On all premolded fiberglass insulation with self-sealing adhesive strips, Contractor shall apply outward clenching staples along the longitudinal strip, on 12 inch centers. Contractor shall additionally apply a mastic along the entire longitudinal strip, taking care to completely cover and seal the staples, and along the circumferential strip at butt joints, completely covering the adhesive strip and at least 3/4 inch on each side of the strip. Mastic shall be Hardcast "Flex-Grip", Rectorseal "Air Lock", or approved equivalent.

B. Supports

1. Metal shields shall be applied between hangers or supports and all types of pipe insulation. Shields shall be formed to fit the insulation and shall extend minimum up to the center line of the pipe. A full coat of insulating sealer shall be applied to the surface of the insulation in contact with the metal shield. The metal shields shall conform to the following chart:

Pipe Size	Metal Ga.	Shield Length
½” to 3"	20 ga.	12"
4” and up	16 ga.	16"

2. On pipes sizes 1-1/2 inches and larger, Contractor shall provide and install at each support, a high density insulation insert to carry the weight of the pipe. Insert shall be premolded to fit the pipe size, shall cover the bottom half of the pipe, and shall be one inch longer at each end than the sheetmetal shield. For pipes that are not susceptible to condensation such as heating water pipes, domestic hot water pipes, etc., the high density insulation insert material shall be calcium silicate, perlite, urethane, or cellular glass. On pipes that are susceptible to condensation such as chilled water pipes, domestic cold water pipes, etc., the high density insulation material shall be urethane or cellular glass.

C. Fittings

1. On pipes carrying warm or hot liquids, the fitting covers may be secured with tacks or snaps with the butt joints taped at the pipe insulation. On pipes carrying cold liquids, the fitting covers shall receive a vapor barrier sealant similar to that in "Pipes" above.

D. Valves
   1. Valves installed in lines carrying cold liquids, i.e. chilled HVAC water, chilled drinking water, or any other liquid of sufficiently low temperature as to cause condensation on the valve body surface, shall have the valve body insulated and vapor sealed up to the bottom of the operating device (handle, wheel, etc.).
   2. Valves installed in lines carrying hot liquids, e.g. heating water, domestic hot water, etc., shall be similarly insulated but not vapor sealed.
   3. All valves provided and installed by others that are installed in pipe to receive insulation are to have provisions to accommodate the insulation. If the Insulation Contractor encounters a valve that does not have adequate provision to accommodate the insulation without reduction in thickness and without compressing the insulation, then it is the responsibility of the Insulation Contractor not to try to insulate the valve body and to inform the General Contractor immediately so that corrective action may be initiated.
   4. Exposed stop valves for plumbing fixtures are excluded.

E. Domestic Cold and Hot Water Piping
   1. Domestic cold and hot water mains and runouts shall be insulated as outlined above. Water lines inside interior partitions to single fixtures are required to be insulated.

F. Cold Condensate Drain Lines
   1. Insulate and continuously vapor seal each cold condensate drain and drain line from the point where it attaches to a fan-coil unit, air handler, or other device until it discharges into a floor drain, hub drain, or other device. The insulation and vapor seal shall run continuously around any P-trap.

G. Elastomeric Insulation
   1. Fittings including, but not limited to, ells, tees, caps, reducers, and valves, shall be adequately insulated and vapor sealed (where required) by using miter-cut tubing or the same insulation in a sheet form.
   2. In all cases, all butt joints and seams are to be completely sealed with a contact adhesive manufactured and provided by the insulation manufacturer, such as Armstrong 520 Adhesive.
   3. Insulation installed outdoors or exposed to sunlight shall have applied two coats of weather-resistant protective finish, Armstrong Armaflex Finish or approved equivalent. The protective finish shall cover 100% of the exposed insulation.

END OF SECTION

SECTION 23 01 00

GENERAL REQUIREMENTS FOR MECHANICAL WORK

PART 1 - GENERAL

1.1 SCOPE

A. This project involves construction of the project as titled above with associated site work as shown on the plans and described herein.

1.2 DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements. Contractor shall determine exact locations from field measurements. Refer also to all architectural, structural, etc., drawings. The lack of specific detail of all offsets, transitions, etc., shall not relieve the Contractor of responsibility to provide such necessary elements to coordinate his work with building construction and with other trades.

1.3 SUBSTITUTION

A. All bids shall be based only on the equipment and materials as scheduled on the drawings and/or as specified, or on equivalent equipment and materials from a pre-approved alternative manufacturer. No bids may be based on a substitute or other alternative without specific written prior approval from the Engineer. Any Bidder who assumes equivalence of products and who bases his/her bid on that assumption, does so at their own risk.

B. A listing of approved alternative manufacturers does not mean that all products of a particular alternative manufacturer are acceptable alternatives to the scheduled items; it merely means that for bidding prior approval is not required. All fixtures and devices must still be submitted according to the prescribed procedures. In addition, some items that have an important visual affect, e.g. electric water coolers, may be required to receive Engineer's or Owner's approval also.

C. Substitute equipment, components, devices and systems shall be fully compatible with the design intent and complete with all required costs included in the bid amount. This includes all modifications to support, structure, pipe and electrical sizing and components needed and all other items necessary for the substitute to perform with no additional cost to the project.

1.4 INTENT

A. All equipment, materials and labor that may be necessary to complete work in accordance with the intent of these plans and specifications shall be furnished by the Contractor without additional cost.

B. All systems represented in the documents shall, unless specifically noted to the contrary, be provided and installed complete with all necessary components to form a complete and functioning system. Submission of bids will be considered confirmation that complete and functional systems have been included in the bids.

C. If any discrepancies or confusion is perceived in the documents, the Contractor shall call such to the attention of the Engineer for clarification of the documents prior to bidding or construction. If any inconsistencies or contradictions within the construction documents are

discovered after the construction contracts are awarded, the Engineer shall determine the intent and correct interpretation of the construction documents.

D. Contractor shall supervise and direct the work competently and efficiently and in accordance with the drawings and specifications. Contractor shall be responsible for using construction means, methods, techniques, sequences, and procedures as are compatible with the project's requirements and will result in a project completed in accordance with the requirements of the drawings and specifications.

1.5 CODES, PERMITS AND FEES

A. Contractor shall comply with all local, state and national codes and shall pay for all applicable costs, fees and permits.

1.6 CONNECTION TO UTILITIES

A. Coordinate connections to utilities directly with utility providers.

B. Verify location, size, elevation, pressure, and any other pertinent data of existing utilities. Additional costs incurred due to a failure to verify such data and to coordinate associated work with respective utility providers shall be borne by Contractor.

C. All costs associated with providing utilities including, but not limited to, connection fees, boring under roads, etc., shall be included in the Contractor's bid price whether such costs are incurred by Contractor or charged by a utility company.

D. Submission of a bid by a Contractor shall be considered an acknowledgment by the Contractor of his compliance with this section.

E. Contractor shall connect water and waste piping and gas service to existing services in accordance with utility company regulations and shall pay all applicable fees and costs. NOTE: Excavate by hand and with caution to locate all utilities prior to machine excavation. Should any service be interrupted, Contractor shall repair it immediately and at no cost to the Owner.

1.7 VIBRATION AND NOISE

A. Each of the various pieces of equipment shall operate without objectionable vibration or noise. All rotating equipment shall be statically and dynamically balanced and shall be mounted, supported, and fastened so that vibration shall not exceed levels specified for the equipment item. The specific type of vibration isolation to be installed shall be submitted to the Engineer for his approval.

B. If, in the opinion of the Engineer, objectionable vibration or noise or transmission thereof to the building occurs, the Contractor shall execute remedial measures as may be necessary to eliminate such unsatisfactory operating conditions, and the work and material thereby required shall be furnished and performed at the Contractor's expense.

1.8 GUARANTEE

A. Each Contractor shall guarantee all labor and materials furnished by him for a period of one year unless otherwise noted. Guarantee period shall extend from the time of final written acceptance of the installation or upon usage by a written directive from the Owner, whichever occurs first. The guarantee shall cover the repair or replacement, without additional cost to the Owner, of any defective material or faulty workmanship.

1.9 SERVICE

A. All necessary service of each system, such as adjustment of controls, air distribution, and water balancing valves, mechanical repair of equipment, and other work requiring specialized training, shall be furnished by the Contractor, at no cost to the Owner, for a period of one year, concurrent with the warranty period specified above.

1.10 SAFETY

A. General
   1. Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work, and Contractor shall comply with all laws governing safety, specifically the "Occupational Safety and Health Standards" and the "Safety and Health Regulations for Construction", state and federal.

B. Hazardous Chemicals
   1. According to OSHA, a hazardous chemical is any chemical which is a physical hazard or a health hazard. This may include items such as paints, solvents, adhesives, sealants, cleaners, etc. If a contractor produces, uses, or stores hazardous chemicals at the workplace, then contractor shall develop, implement, and maintain a hazard communication program in compliance with latest OSHA requirements. In projects with multiple tenants in which the building is partially occupied during the project, contractor shall inform the building manager or owner, according to OSHA guidelines, of any hazardous chemicals being produced, stored, or used in the building so that other tenants may be notified. Contractor shall employ required methods of training, information, handling, ventilation, labeling, storing, disposal, and removal of hazardous chemicals.

1.11 COORDINATION

A. Each Contractor's bid shall include the necessary detail and interconnection work to coordinate his work with the work of other trades. Failure on the part of the Contractor to coordinate with all other trades resulting in interferences shall be sufficient reason to require the Contractor to replace or rebuild the work involved at no extra charge.

1.12 STORAGE OF MATERIALS

A. Each Contractor shall provide temporary storage facilities suitable for equipment stored at the job site. Storage facilities shall be rain-proof and lockable as required. Materials or equipment stored on site but not in a lockable, rain-proof storage facility shall be stored above ground or above slab. Contractor shall take necessary precautions to prevent entry of and/or damage from dirt, trash, water, or vermin. Equipment not properly stored and protected shall be, at the discretion of the Engineer, replaced at no cost to Owner. Roofs are not acceptable storage areas unless specifically allowed in writing by the Engineer.

PART 2 - PRODUCTS

2.1 SUBMITTALS

A. Provide submittal to the A/E within 45 days of commencement of the Contractor’s agreement with the Owner.

B. In addition, submit specific information on equipment, products, and principal materials specified. Indicate and provide names of manufacturers, catalog and model numbers, cut

sheets, and such other supplementary information as necessary for evaluation. Include all items mentioned by model number and/or manufacturer's name in the specifications or on the drawings, including but not limited to the following:

1. HVAC - All equipment, air devices, insulation, piping, valves, controls and other principal materials.

C. Prepare and submit large scale shop drawings (minimum ¼"= 1'-0") of the central mechanical room, central electrical room and each individual electrical room. These drawings shall show to scale the actual sizes of each piece of selected mechanical, plumbing and electrical equipment along with the required clearances for maintenance or removal/replacement. Provide bottom of pipe, duct, equipment or other such vertical obstructions. Provide sections where necessary and as requested by the Engineer for clarity to describe equipment heights, piping elevations and other such clearance issues. Drawings shall be prepared on maximum 30" X 42" sheets using AutoCad® latest format. Submit 3 copies of the drawing sheets and a compact disk or thumb drive with the drawing files.

D. Requirements for submittal
   1. Each submittal shall:
      a. bear a stamp or specific written indication that Contractor has reviewed and approved all submittals prior to submission to Engineer,
      b. have all information deleted by Contractor that pertains to the means and methods of construction or to the fabrication, assembly, installation, or erection process (approval by Engineer shall not extend to these areas unless specifically noted by Engineer),
      c. be clearly marked as to which specific piece of equipment is being submitted, by use of a permanent marker, stamp, etc., so as to distinguish it from other pieces of equipment that may occur on the same page,
      d. be clearly marked as to which available options are being submitted that are associated with a piece of equipment, and
      e. be complete with respect to quantities, dimensions, specific performance, materials, and similar data to enable Engineer to review the proposed equipment.
   2. Omission by Contractor of any of the above requirements for submittals will subject submittal to automatic rejection without review.
   3. Any submittals received by Engineer that were not requested shall be returned without review of any kind.

E. Substitutions
   1. In Addition, no substitution is allowable without Engineer's written approval ten days prior to bid due date (unless otherwise allowed by Engineer) unless the manufacturer is listed on the Drawings or in the specifications as being a pre-approved alternative manufacturer. Any submittal received without such written approval or prior approval is subject to unqualified rejection.
   2. Contractor's responsibility shall be to verify that submitted substitute equipment will fit in the space available. The Contractor's submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the drawings or specifications. Any such changes shall be described in writing, briefly but completely.
   3. The Contractor shall be responsible for the cost of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The cost shall be complete, that is, it shall include the costs affect on any and all other trades.
   4. The Engineer may request shop drawings of mechanical rooms or systems of the substituted equipment.

F. Installation Instructions
   1. For certain products or systems as identified in subsequent specification sections, the Contractor shall, as required, provide copies of manufacturer's installation instructions with the submittal. When required as such, the installation instructions are considered

part of the submittal and their omission may result in automatic rejection of the submittal. Where more than one identical device is scheduled, only one set of installation instructions needs to be submitted, e.g., if seven five-ton split system air conditioners are scheduled, only one five-ton unit installation instructions need to be submitted. Similarly, if one set of installation instructions is identified by the manufacturer and on the instructions to be applicable to more than one type or size of devices, e.g., if one set of air conditioner instructions is good for three, four, and five-ton units, then only one instruction set is required for those devices.

2.2 MATERIALS

A. All materials shall be new and of the quality specified. Materials shall be free from defects. Where manufacturers' names are mentioned in these specifications or on the plans, it has been done in order to establish a standard of quality and construction.

B. Contractor will be responsible for transportation of his materials to and on the job and will be responsible for the storage and protection of his materials and work until the final acceptance of the job. At the end of each workday, each Contractor is responsible for covering or protecting his work or materials that may be susceptible to damage even if such damage is the result of unforeseen causes, e.g. an overnight thunderstorm. Failure to do so will be sufficient cause for rejection of any item in question, and any such item shall be replaced at Contractor's expense.

C. Contractor shall verify that all pieces of equipment will fit through available openings in building and that all equipment can be installed without modification of building structure.

2.3 LABELING

A. Each device for which an independent testing authority has established a standard shall have affixed a label indicating its compliance and listing. Such independent testing authorities shall include, but not be limited to, the following:

A.D.C.	Air Diffusion Council
A.G.A.	American Gas Association
A.M.C.A.	Air Movement and Control Association
A.N.S.I.	American National Standards Institute
A.R.I.	Air-Conditioning and Refrigeration Institute
A.S.H.R.A.E.	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
A.S.M.E.	American Society of Mechanical Engineers
A.S.P.E.	American Society of Plumbing Engineers
A.S.S.E.	American Society of Sanitary Engineers
A.S.T.M.	American Society for Testing and Materials
A.W.W.A.	American Water Works Association
C.T.I.	Cooling Tower Institute
F.M.	Factory Mutual
I.A.P.M.O.	International Association of Plumbing and Mechanical Officials
I.C.B.O.	International Conference of Building Officials
M.S.S.	Manufacturers Standardization Society of the Valve and Fittings Industry
N.A.P.H.C.C.	National Association of Plumbing, Heating, Cooling Contractors
N.B.S.	National Bureau of Standards
N.E.B.B.	National Environmental Balancing Bureau
N.E.C.	National Electric Code
N.E.M.A.	National Electrical Manufacturers Association
N.F.P.A.	National Fire Protection Association
N.R.C.A.	National Roofing Contractors Association

N.S.F.	National Sanitation Foundation
P.D.I.	Plumbing and Drainage Institute
S.B.C.C.I.	Southern Building Code Congress International
S.M.A.C.N.A.	Sheet Metal and Air Conditioning Contractors' National Association
T.I.M.A.	Thermal Insulation Manufacturers Association
U.L.	Underwriters Laboratory

2.4 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Section 01 78 23 Operation and Maintenance Data.

B. Contractor shall prepare and provide four copies of operating and maintenance manuals. Contractor shall deliver these four bound sets to the Engineer for approval. Each manual shall be in a ring binder and shall be indexed with dividers for each section. Delivery of required documents is a condition of final acceptance.

C. Each manual shall contain at least the following:
   1. Certificates of acceptance from inspecting authorities,
   2. Waiver of all liens,
   3. For each piece of equipment:
      a. operating and safety instructions, service manuals, and parts lists applicable to each item of equipment furnished (Contractor shall clearly distinguish in the manual between information that pertains to the particular equipment and information which does not.),
      b. nameplate data and design parameters for equipment,
      c. name, phone number, and address of vendor, manufacturer's representative, and warrantee provider,
      d. start-up report, if applicable,
   4. copies of all shop drawings and as-built drawings (as-built drawings shall be on a reproducible vellum as produced by a xerox or photographic process),
   5. copies of all approved submittals,
   6. warranties with start dates and end dates for each piece of equipment and/or for each system (warranties shall begin on date of substantial completion and acceptance by Owner),
   7. names, phone numbers and addresses of all subcontractors, vendors, manufacturer's representatives, and warrantee providers,
   8. certification letter from each Contractor that each system furnished and installed by that Contractor and/or Subcontractors is started-up, balanced, adjusted and checked for proper operation in accordance with the intent of the contract documents, and
   9. acceptance letter from each Contractor with blanks for date of acceptance and date of expiration of warranties and guarantees.

2.5 TAGGING

A. Equipment to be Tagged: Each major piece of equipment discussed in the specifications or scheduled on the drawings shall have affixed a tag showing the name or function of that piece. The list of equipment to receive tags shall include, but not be limited to, the following:
   1. air moving or air conditioning equipment,
      a. air handlers,
      b. heat pump units,
      c. fan-coil units,
      d. exhaust fans,
      e. variable air volume boxes
   2. valves,

a. tag shall indicate function such as "domestic cold water shut-off", "domestic hot water shut-off", "chilled water shut-off", etc.,
b. tag shall be attached with brass chain,
c. exceptions that need no tag:
(1) control valves for HVAC at or near coils,
(2) shut-off valves near to and serving only one device such as a plumbing fixture or a fan-coil unit,
(3) isolation valves located at or near the device being isolated,

3. Items which have no unique name, such as air devices, plumbing fixtures, lights, etc., need not have tags.

B. Tags
1. Material - Tags shall be engraved plastic, brass, or anodized aluminum. Surface mounted tags shall have pressure sensitive adhesive backing. Tags for outdoor use shall be mounted with brass screws.
2. Lettering - Characters shall be minimum 1/4" in height and shall be of a contrasting color to the tag.
3. Installation - Surface mounted tags with adhesive backs shall be applied only to clean, dry surfaces. Adhesive tags shall not be applied to surfaces that are subject to condensation or excessive heat.

C. Alternatives
1. For larger equipment such as large air handlers, switchgear, etc., the use of manufactured stencils (2 inch characters) and spray paint (in contrasting color to equipment) is an acceptable alternative.
2. Individual adhesive letters are not acceptable.
3. Other alternatives are acceptable only by submitting samples or manufacturer's literature to Engineer and receiving written permission.

2.6 MOTORS AND MOTOR STARTERS

A. Motors
1. Unless scheduled otherwise, each electric motor shall be high efficiency type.
2. Each single-phase motor larger than 1/10 (one-tenth) horsepower and each single phase motor that drives a pump or compressor shall be a permanent split capacitor type. Each polyphase squirrel-cage induction motor shall be an energy efficient type as defined in NEMA document No. MG1-1987.

B. Motor Connections
1. Motor starters, unless scheduled otherwise or packaged with the equipment, shall be provided and installed by the Electrical Contractor. The Mechanical Contractor shall provide to the Electrical Contractor a complete list of motors requiring starters or other connections, including power and control, and shall include the following information for each such motor:
a. a tag reference to the piece of equipment for which the motor is needed,
b. the voltage and number of phases,
c. the motor requirements in terms of horsepower, running load amps, full load amps, etc.,
d. any other pertinent information required or requested by the Electrical Contractor.
2. The Electrical Contractor shall receive and review the above information and advise the Mechanical Contractor and Engineer of any discrepancies or required modifications. The Electrical Contractor shall provide and install the correct starter, conductors, and other devices per the electrical drawings, specifications, and National Electrical Code.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. The workmanship shall, in all respects, be of the highest grade, and all construction shall be done according to the best practices of the trade. Piping, ducting and conduit shall be concealed unless otherwise noted, and installed square to the building lines. Any work not meeting this requirement shall be replaced or rebuilt without extra expense to the Owner.

3.2 INTERIM CLEANING

A. The Contractor shall maintain the work area in a clean condition during the course of the work. All debris, scrap and surplus material shall be removed from the work area on a periodic basis with a minimum of at least once per day.

B. All stored material shall be support above floor level and be protected from becoming damaged or dirty.

C. All installed material shall have open ends closed and protected from entrance of foreign material during construction.

D. Prior to enclosing an area such as a ceiling or chase wall, the installed material and surrounding area shall be thoroughly cleaned. After removing loose material, the area shall be vacuum cleaned or blown out with a portable blower to remove dust from surfaces.

3.3 CUTTING, PATCHING, AND PENETRATIONS

A. No joists, beams, girders, columns, slabs, or other structural elements shall be cut, drilled, or altered in any way by the Contractor without first obtaining written permission and instructions from the Engineer.

B. Where cutting any non-structural element(s) of walls, floors or ceilings is necessary to permit the installation of any work under this contract, or to repair any defects that may appear up to the expiration of the guarantee, such cutting shall be done by Contractor with as little damage as reasonably possible to the element being cut, to adjacent elements, or to the work of other trades.

C. After the necessary work has been completed, the damage shall be repaired by the Contractor, who shall pay all costs of such cutting and patching. All patching or sealing of cuts, penetrations, etc., including final appearance of same, shall be done to the approval of the Engineer. In absence of specific finish instructions, provide finish to match adjacent surfaces.

D. Where a penetration or cutting of a ceiling, wall, or other building membrane is required or made, each such penetration or cut shall be made neatly with a cutting tool such as a saw, sharp knife, etc., and not with an impact tool such as a hammer, screwdriver, wrench, crowbar, etc. Each such penetration or cut shall be no larger than reasonably necessary, and penetrations in occupied or publicly accessible spaces shall have a chrome-plated escutcheon installed large enough to cover the entire opening.

E. Where a penetration is made in a fire-rated building assembly (wall, floor, ceiling, floor-ceiling, roof-ceiling, etc.) or in a membrane of a fire-rated assembly, and no specific firestopping assembly is shown on Drawings, Contractor shall provide and install a firestopping assembly or product as listed in the latest edition of U.L. Fire Resistance Directory. Firestopping assembly or product shall be appropriate for the size and material of the penetrating element, for the penetrated building element, for the presence or lack of insulation, for the size of the annulus around the penetrating element, etc. Contractor shall

include firestopping assembly or product in submittals. Contractor shall review and verify fire-ratings of building assemblies as shown on Architectural plans. Lack of knowledge of a fire-rating of an building assembly shall not relieve Contractor of requirement to install firestopping.

3.4 EQUIPMENT AND PIPING SUPPORTS

A. All supporting systems for piping, equipment, and materials supported by the building structure shall be submitted to the Engineer for approval prior to purchase and installation.

B. Provide 3-1/2” (minimum, or as called out elsewhere) high concrete house keeping pads for all floor mounted equipment and piping. Pad shall have chamfered edges and be painted to match the floor.

3.5 ACCESSIBILITY

A. Access Panels
   1. Access panels shall be provided wherever necessary for possible future replacement, adjustment, or maintenance of operating devices such as machinery, valves, dampers, switches, relays, etc., or to other critical non-operating devices such as pull boxes, inspection parts, gauges, etc. Such access panels shall be provided and installed by Contractor, whether or not shown on drawings, and shall be brought to the attention of Engineer for his approval of type, color, etc. Where access is provided in rated members, the access panels shall be of a type that maintains the integrity of the member penetrated.

B. Access to Equipment
   1. All pipes, tubing, conduit, etc., including, but not limited to, chilled water and heating water piping, domestic cold water and hot water piping, fire sprinkler piping, waste and vent piping, drain piping of any type, electrical conduit, wiring not in conduit, and pneumatic control tubing shall be installed in such a way so as not to prevent and/or not to make unreasonably difficult the removal, operation, use, or maintenance of equipment, access panels or doors, pathways (especially in attics or crawl spaces), observation ports, measurement or balancing devices, junction boxes, etc.. If access for these purposes is prevented or made unreasonably difficult in the opinion of the Engineer, then the Contractor shall make modifications or repairs at no cost to anyone except the Contractor. Such modifications or repairs shall be considered neither complete nor adequate until the Engineer are satisfied that access for the above purposes is achieved.

3.6 FIELD REPORTS

A. The Contractor shall be required to respond all deficiency items noted in Field, Site Visit, Punch List and other such reports provided by the A/E. The response shall address each deficiency item in the same order as the report with annotations as to what was done to remedy the deficiency, who performed the work and when it was done.

3.7 OPERATING TESTS

A. General
   1. After all mechanical and electrical systems have been completed and put into operation, Contractor shall subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation. All associated costs of such tests, including labor, fuel, apparatuses, piping, etc., shall be borne by the Contractor.

2. Contractor shall make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. The Contractor shall return to the project during the first year and in the opposite season from which the system was initially operated and shall check the proper operation of the mechanical and electrical systems. Contractor shall perform any adjustments or corrective procedures required for the proper operation of all systems.

B. Notification
   1. Contractor shall give the Engineer seven day's prior notification of any test so that the Engineer will have time to be present if he so desires.

C. Reports
   1. After each test is performed, the Contractor who performed the test shall prepare and issue a report to include the following information:

      a. Project name and location, date of the report,
      b. Contractor's name, address, and telephone number; if the Contractor performing the test is a Subcontractor, indicate also for whom the test is being performed, their name, address, telephone number, and a contact person's name,
      c. the date, or range of dates, of the test,
      d. the name of the Contractor's employee who was responsible for performing or for overseeing the performing of the test,
      e. a brief description of the system being tested,
      f. a brief description of the testing procedure,
      g. a summary of the test result(s),
      h. a brief assertion that the system was tested as stated and that the system complied with the requirements of the contract documents or those of the Authority Having Jurisdiction, whichever is the most stringent, and
      i. a hand-written date and signature of someone who has authority or responsibility from the company that performed test(s), and a hand-written brief note stating that the above information is true and accurate.
   2. If the tested system is tested in parts, then one report may be made after the last part is tested.
   3. The report shall be issued to the Engineer within five working days after the test is completed.
   4. Such reports shall be required of all mechanical or electrical systems which require tests for pressure, water tightness, flow, resistance, or conductivity.

D. Services of a Manufacturer's Representative
   1. Reports: For all major systems or equipment required by subsequent specifications sections to have tests or inspections by a manufacturer's representative, the manufacturer's representative shall prepare a written report to be sent to the Engineer for subsequent distribution to the Engineer, Owner, General Contractor, and to whomever else the Engineer deems necessary. The report shall include at least the following:
      a. date of the visit, name and title of the representative, name and location of the project,
      b. name and title of any observers,
      c. a brief description of the equipment being inspected and/or tested,
      d. a brief discussion of the quality of the installation including any important items (in the manufacturer's experience) that were done correctly, as well as any items that were done incorrectly or not to recommendations,
      e. a list of tests and/or inspections performed and the results of same, and
      f. a brief statement of whether the installation conforms to manufacturer's recommendations and/or requirements, and if not what is required to bring the installation into conformance.

2. Deficiencies and Defects
    a. Contractor shall be responsible for providing all labor and materials, at no cost to anyone except Contractor, to correct any deficiencies or defects reported by manufacturer's representative.
    b. If, in the opinion of the manufacturer's representative, the deficiencies and defects are sufficiently serious, then Contractor shall arrange for, and bear all costs of, another inspection by manufacturer's representative after corrective measures have been taken.
3. The above process shall continue until the manufacturer's representative approves the installation.

3.8 INSTRUCTIONS FOR OWNER

A. Contractor shall instruct the Owner's operating personnel in the operation and maintenance of all mechanical equipment. Contractor shall furnish any special servicing tools required for maintenance.

3.9 DEMONSTRATION

A. Contractor shall conduct a demonstration of the installation upon completion of the work. Prior to this, all work shall have been completed, tested, balanced, and placed in operation. Qualified persons must be present at demonstration to operate all systems and prove the performance of the equipment. The schedule for this demonstration shall be coordinated with the Engineer.

3.10 CLEANUP

A. At substantial completion of the project, thoroughly clean all equipment and systems of all dirt, debris and foreign material.

B. This shall include cleaning coils and fans inside of air handlers, cleaning the interior of duct systems and wiping down the interior of all electrical equipment.

C. Remove all unused temporary wiring or construction lighting and power and all unused material from above the ceilings and from hidden recesses.

END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1 – GENERAL

1.1 SCOPE

A. Furnish all labor and materials necessary for the complete installation of thermal insulation on all hot and cold surfaces which require insulation for heat or cold conservation, comfort and safety of occupants, efficiency or ease or operation, or to prevent condensation or dripping. The insulation shall be complete and effective throughout the building.

B. Section Includes:
   1. Ductwork insulation.
   2. Piping insulation
   3. Insulation accessories including vapor retarders and accessories.

C. All work shall be performed in a neat and professional manner by a Contractor or Subcontractor regularly engaged in the insulation field. The Mechanical Contractor shall be responsible for the bidding and execution of this work.

D. Any equipment or devices mentioned specifically in this section, or any equipment or devices installed by the Mechanical Contractor that can have or cause temperatures low enough to cause condensation shall be adequately insulated and vapor sealed. If equipment, devices, or required insulation product is not specifically mentioned in this section or shown on drawings, the Contractor is required to request and obtain written instructions from the Engineer. If condensation should occur due to inadequate or missing insulation and/or vapor sealing, such damage, including damage to other affected property or building elements, shall be repaired by Contractor at no cost to the Owner.

1.2 GENERAL REQUIREMENTS

A. All insulation inside the building shall have composite (insulation, jacket or facing, and adhesive or cement used to adhere the jacket to the insulation) flame-spread rating of 25 or less and smoke-developed rating of 50 or less as tested under procedure ASTM E-84 and NFPA 255.
   1. Insulation with a less stringent flame and smoke rating may be used only with the written permission of the Engineer.
   2. Insulation products that meet the 25/50 rating requirement but that melt and drip flammable products, such as closed cell polyethylene products, are not acceptable.

B. Accessories such as adhesive, mastics, cements, and cloth for fittings shall be permanently fire and smoke resistant. Chemicals used for treating paper in jacket laminates shall be unaffected by water or humidity.

C. All adhesives, sealers, vapor barrier coatings, etc., shall be compatible with materials to which they are applied and shall not corrode, soften, or attack such materials in either the wet or dry state. Unless otherwise approved, all adhesives, sealers, coatings, mastics, etc., shall be water-based.

D. Any insulation product found to be damaged or has become wet, whether installed or stored, shall be immediately removed and replaced with a new product.

E. Thermal insulation shall be applied where needed, including but not limited to the following systems, as described herein:

1. Ductwork,
2. Refrigerant piping

PART 2 - PRODUCTS

2.1 DUCT WORK INSULATION

A. Air Conditioning Duct
1. Indoors: Insulation shall be foil faced 2" thick duct wrap, 1.0 lb/cu.ft. density, R-5 (installed) and a foil-skrim-kraft composite vapor barrier. Insulation shall be CertainTeed Standard Duct Insulation, Knauf Duct Wrap, Owens-Corning Fiberglas, Manville R-Series Microlite, or approved equivalent.
2. Duct liner: Where indicated on the drawings, provide listed duct liner of the thickness and density as described on the drawings. Liner shall have anti-microbial facing and be glued and pinned on 18 inch centers.

2.2 PIPING

A. Refrigerant Piping: As recommended by the equipment manufacturer. Plenum UL 25/50 rated.

B. Condensate Piping: Elastomeric closed cell tubing, UL 25/50 rated, ½" wall thickness.

ART 3 - EXECUTION

3.1 DUCTWORK EXTERNAL INSULATION

A. Applications:
1. Insulate and vapor seal the following ductwork:
a) air conditioning supply air ductwork,
b) air conditioning supply air ductwork that is concealed or located in mechanical rooms,
c) air conditioning return and exhaust in non-plenum areas,
2. The following ductwork does not require insulation:
a) exhaust air ductwork unless noted,
b) return air ductwork unless noted.

B. Air Conditioning Duct
1. Before applying duct wrap, sheet metal duct shall be clean, dry, and tightly sealed at all joints and seams.
2. Prepare overlap by removing approximately 2 inches of insulation from facing. Wrap insulation around duct with facing to the outside so the 2-inch flap completely overlaps facing and insulation at the other end of stretch out. Insulation shall be snugly butted.
3. Seams shall be stapled approximately 6 inches on center with outward clinching staples, then sealed with 4-inch wide pressure-sensitive tape matching the facing and designed for use with duct insulation. Tape shall be Hardcast Foil-Grip 1402 or approved equivalent.
4. Adjacent sections of duct wrap insulation shall be snugly butted with the circumferential 2-inch tape flap overlapping and secured as recommended for longitudinal seam. In lieu of pressure-sensitive tape, two coats of vapor retarder mastic reinforced with one layer of 4-inch wide open weave glass fabric may be used.
5. The insulation on the underside of ductwork 24 inches or greater shall be secured

with mechanical fasteners and speed clips spaced approximately 18 inches on center. The protruding ends of the fasteners should be cut off flush after the speed clips are installed, and then sealed with the same tape as specified above.

6. Wherever an externally insulated duct rests on a trapeze hanger, remove a strip of the external flexible wrap and install a high density rigid insulating board such as calcium silicate, foamglass, or approved equivalent between the duct and the hanger. Rigid insulation shall be at least twice the width of the hanger and shall be full width of the duct. Repair the insulation facing to provide a continuous vapor barrier.
7. Vapor barrier shall be complete and unbroken.

3.2 PIPING INSULATION INSTALLATION

A. General

1. All insulation shall be continuous through wall and ceiling openings and sleeves. Insulation on all cold surfaces, where vapor barrier jackets are used must be applied with a continuous unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation. Where insulation is discontinued, special care shall be taken to taper the insulation to the pipe to allow for vapor barrier to completely seal off end of the insulation.
2. Insulation shall be applied after the surfaces have been thoroughly cleaned and dry and all piping has been tested and proven tight.
3. Circumferential self-sealing strips shall be applied to all butt joints to form a positive closure.

B. Supports

1. Metal shields shall be applied between hangers or supports and all types of pipe insulation. Shields shall be formed to fit the insulation and shall extend minimum up to the center line of the pipe. A full coat of insulating sealer shall be applied to the surface of the insulation in contact with the metal shield. The metal shields shall conform to the following chart:

Pipe Size	Metal Ga.	Length of Shield
½” to 3"	20 ga.	12"

C. Cold Condensate Drain Lines

1. Insulate and continuously vapor seal each cold condensate drains and drain line from the point where it attaches to a fan-coil unit, air handler, or other device until it discharges into a floor drain, hub drain, or other device. The insulation and vapor seal shall run continuously around any P-trap.

D. Elastomeric Insulation

1. Fittings including, but not limited to, ells, tees, caps, reducers, and valves, shall be adequately insulated and vapor sealed (where required) by using miter-cut tubing or the same insulation in a sheet form.
2. In all cases, all butt joints and seams are to be completely sealed with a contact adhesive manufactured and provided by the insulation manufacturer, such as Armstrong 520 Adhesive.
3. Insulation installed outdoors shall have applied two coats of weather-resistant protective finish, Armstrong Armaflex Finish or approved equivalent. The protective finish shall cover 100% of the insulation exposed to the outdoors.

END OF SECTION

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SECTION 23 30 00

AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The work of this Section includes all labor, material, equipment, and appurtenances indicated on the Drawings and herein specified for the installation of air distribution systems, including supply, exhaust, return, and outside air.

1.2 SUBMITTALS

A. Duct schedule: Provide a duct schedule or table indicating the following information, according to appropriate pressure class:
   1. each duct size group (as defined in SMACNA “HVAC Duct Construction Standards”)
   2. duct sheetmetal gauge,
   3. duct joint and reinforcement spacing,
   4. transverse joint construction,
   5. intermediate reinforcement construction, and
   6. hanger type and spacing.

B. Air Devices: Submit manufacturer’s standard technical product data including capacity ratings, throw, noise, drop, diffusion, terminal velocities, adjustability, construction details, finish and mounting details.

1.3 AS-BUILT DRAWINGS

A. Maintain field changes on a drawing set at the construction site. These drawings shall be available at the construction site to the Architect/Engineer upon request.

B. Upon completion of the project, update the shop drawing CAD files to reflect the field changes. A/E will provide ACAD files to contractor at no charge upon request.

1.4 COORDINATION OF WORK

A. Prior to producing shop drawings and installation of work, coordinate work with other trades including structural, plumbing, fire protection, and electrical.

B. Verify all ceiling heights and construction details.

C. Lack of coordination of work will not be considered grounds for additional cost or time requests.

PART 2 - PRODUCTS

2.1 FLEXIBLE CONNECTIONS (Duro Dyne 'Metal Fab' or approved equivalent)

A. Provide and install where shown on the drawings and at all connections between ductwork and equipment subject to vibration or movement such as fan-coil units and exhaust fans.

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B. Product shall be U.L. classified and shall meet the requirements of NFPA Standards 90A and 90B having connection material of an approved flame retardant fabric or with sleeve joints with packing of approved material, each having a flame spread rating not in excess of 25 and a smoke developed rating not in excess of 50.

C. Flexible connectors shall be installed upstream of any supply-side fittings and take-offs and downstream of any return-side fittings. Connections shall have suitable metal collar frames at each end. Allow at least one-inch slack in each connection to assure no vibration is transmitted from fan to ductwork. Connections shall be not less than four-inches long nor longer than ten-inches.

2.2 AIR DEVICES

A. Grilles, Registers, and Diffusers - Anemostat, Krueger, Metal*Aire, Price, Titus, Tuttle & Bailey, or Approved Equivalent
   1. Provide as shown and scheduled on the Drawings or as otherwise approved, to deliver the indicated volume of air without objectionable noise or draft.
   2. Provide grilles, registers, and diffusers with two coats of factory applied baked on white primer, unless otherwise scheduled on the Drawings.

B. Access doors:
   1. Provide factory-made access doors where shown and where otherwise necessary to provide access for removal of filters, for cleaning upstream face of coils and for maintaining dampers of any kind.
   2. Provide doors double walled with insulation between walls of same thickness as on ductwork.
   3. Provide door shall be minimal 12"x12" nominal size where duct size permits. Where duct size is smaller, provide door shall be as large as possible to fit into the duct.

2.3 FLEXIBLE DUCTWORK:

A. Construction: Provide ductwork conforming to UL 181, "Factory-Made Air Ducts and Connections," Class I, and NFPA 90A.

B. Insulation: R-6 minimum 2-inch-thick, 0.76 pound per cubic foot fiberglass.

C. Sheath insulation with reinforced aluminized polyester vapor barrier having a permeance not exceeding 0.05 per ASTM E 96, "Standard Test Methods for Water Vapor Transmission of Materials," Procedure A.

D. Reinforcement: steel helical spring

E. Interior: non-porous, CPE or similar.

F. Pressure rating: 10” w.c. positive and 2” w.c. negative.

G. Taps: Provide boot or spin-in type as described on the drawings. Provide with damper with insulation standoff damper operator with quadrant lock.

2.4 SHEET METAL DUCTWORK

A. General
   1. Ductwork shall be made of single wall galvanized steel sheets. Ductwork shall be round or rectangular as shown on the Drawings. Straight pieces of round concealed ductwork shall be spiral lockseam or longitudinal snap-lock.
   2. Ducts shall be constructed in accordance with the recommended construction for the appropriate pressure class insofar as gauges of metal to be used,

bracing of joints and joint construction, fittings, and fittings construction, etc., as established in HVAC DUCT CONSTRUCTION STANDARDS, Latest Edition, published by the Sheet Metal and Air Conditioning Contractors National Association, Inc., (SMACNA).

a. Ductwork shall be constructed to the following minimum pressure classes:

(1) Fan-coil, supply and return and downstream of VAV's

(a) below 2,000 cfm ± 1"

(b) above 2,000 cfm ± 2"

(2) Air Handlers and RTUs

(a) Up to 3HP

(i) supply +2"

(ii) return -1"

(b) 3HP & up

(i) supply +3"

(ii) return -2"

(3) Exhaust - 1"

3. Sealing

a. Snap-lock duct and rectangular duct: seal all ducts to SMACNA Class 'A' rating, that is, "All transverse joints, longitudinal seams, and duct wall penetrations" shall be sealed.

b. Spiral lockseam: same sealing as snap-lock except sealing of longitudinal seams is not required.

c. A gasketed mechanical joint system such as Ductmate does not require sealing.

d. Sealant shall be water-based product; solvent based products are expressly prohibited. Product shall be recommended by manufacturer for HVAC duct application, and it shall cure to a flexible film with a strong adhesive bond to common duct materials. Product shall be rated by manufacturer for operating temperature limits from zero degrees F to 200 degrees F. Product shall have been tested per ASTM E84 procedures and shall have a maximum flame spread rating of 25, a maximum fuel contributed rating of 5, and a maximum smoke developed rating of 20. Product shall be Hardcast "Iron Grip" IG-601 or "Flex-Grip" FG-550, Rectorseal "Air-Lock", Foster 32-50, United McGill Duct Sealer, or approved equivalent.

2.5 VARIABLE AND CONSTANT AIR VOLUME BOXES (VAV AND CVAV)

A. Manufacturers: Titus, Metalaire, Nailor, ETI, Krueger, Price, and pre-approved equivalents.

B. VAV Operation (cooling and reheat): Boxes shall be pressure independent with controls supplied by the Temperature Controls Contractor. Unit shall be capable of 0 to 110% of airflow scheduled on the plans.

C. Case shall be galvanized internally insulated sheet metal. Total pressure loss through the device at scheduled maximum flow shall be less than 0.25-inches static pressure. Unit shall have sound rating of less than NC=25 at design airflow.

D. Internal box insulation shall be 1" inch thick coated fiber-free lining and compliant with UL 181 and 723, and ASTM C665 and E84.

E. Provide a multi-port flow cross piped to the exterior of the box for connection of the controls.

F. Damper shall be single-blade double-layered galvanized sheet metal with nylon or

similar bearings on each end of the axle.

G. Controls shall be provided by the Temperature Controls manufacturer and supplied to the VAV box manufacturer for factory mounting.

H. Reheat coil shall have copper tubes with mechanically bonded aluminum fins. Provide insulated cover of ends of reheat coils to prevent condensation.

PART 3 - EXECUTION

3.1 GENERAL

A. During construction, all air-moving equipment and ducts shall be protected from entrance of water, dust, trash, vermin, etc., per Section 15010. Fans of all types not yet connected to ductwork shall have inlets and outlets covered with plastic sheet secured temporarily with tape, wire, etc. Such covers shall be maintained throughout the construction phase until the ductwork is connected.

B. Ducts shall be routed in conjunction with pipes, electrical, conduits, lights, ceiling hangers, etc., so as to avoid interference insofar as possible.

3.2 CLEANING

A. Ducts, plenums, and casings shall be thoroughly cleaned of all debris and blown free of all small particles of rubbish and dust before installing outlet faces. Equipment shall be wiped clean, with all traces of oil, dust, dirt or paint spots removed. Temporary filters shall be provided for all fans that are operated during construction. New filters shall be installed after all construction dirt has been removed. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to produce tension. All control valves and other miscellaneous equipment requiring adjustment shall be adjusted to settings indicated or as directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

3.3 DUCTWORK, GENERAL

A. Support
   1. Support each fitting that effects a change in direction, either vertical or horizontal, at the fitting.
   2. Support each fitting that has a branch intersection at the fitting.
   3. Support ductwork at or near connections to equipment.
   4. Support each duct independently. Do not support one duct from another except as allowed by SMACNA.
   5. Do not use wire as a hanger, even to support another hanging device such as a trapeze, regardless of acceptability by other authorities. Only straps, threaded rods, and channel may be used as hangers.

B. Install ductwork without twisting.

C. Install ductwork shown on the Drawings to be horizontal as straight and level as possible; exception: duct with slope designed to provide drainage toward a device, such as grease exhaust duct or dishwasher exhaust duct.

D. Install ductwork shown on the Drawings to be vertical as vertical as possible in both vertical directions. Vertical ductwork extending more than one floor in height shall be supported at every floor or every 12 feet, whichever is less.

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E. Install ductwork so that no duct or hanger is touching other duct or building elements such as framing, structure (except for supports), piping, conduit, etc.

3.4 SHEETMETAL DUCTWORK

A. In supporting sheetmetal ductwork, SMACNA, in HVAC Duct Construction Standards, Table 4-1 lists several combinations of hanger types and hanger spacing that are equivalent for various duct sizes. Contractor shall conform to one of the listed combinations (except for prohibited wire hangers).

B. Duct sealing material shall not be used to fill gaps caused either by careless or unprofessional work during fabrication or erection or by damage after erection. Surfaces on which sealant is to be applied shall be cleaned and dry before application. If any oil or grease is present, surface shall additionally have a degreaser applied.

C. Install duct liner where shown on drawings. Duct liner is used for acoustic attenuation only and is not to be applied in general.

D. Connections
   1. Duct-to-duct connections or "splicing" is prohibited.
   2. At sheetmetal taps and at air devices, insulation and outer jacket shall be slit and carefully peeled back approximately 4-inches.
   3. Inner duct shall be secured tightly to the collar, without deformation of the collar, using a stainless-steel draw band system.
   4. Insulation shall be pulled back over duct and collar and snugly butted against the sheetmetal or air device. Insulation shall be snugly secured with another draw band without significant compression of the insulation.
   5. A mastic type sealer shall be applied to the longitudinal cut in the duct outer jacket and all along the circumference of the butt joint between the flex duct and the sheetmetal duct. In addition to sealing the joints, the mastic material shall form a flexible, effective vapor seal.

3.5 FLEXIBLE DUCTWORK

A. Maximum length from take-off to air outlet shall be 8 feet.

B. Maximum one 90-degree bend in any length.

C. Provide continuous length with no intermediate joints.

D. Connect each end with stainless steel screw operated drawbands.

E. Support clear of the ceiling tile, light fixtures and air terminal

F. Support for maximum sag of 1/2-inch per foot.

G. Provide duct with UL labels visible every 10 feet indicating conformance to UL 181.

END OF SECTION

SECTION 23 81 27

MINI-SPLIT SYSTEM HEAT PUMP AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 SCOPE

A. Provide and install split system heat pump air conditioning systems with fan coil evaporator units as described on the drawings and as specified herein.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data, including rated capacities, weights, furnished specialties and accessories and installation and start-up instructions.

B. Drawings: Submit manufacturer's drawings indicating dimensions, required clearances, and refrigeration component balance diagram.

C. Wiring Diagrams: Submit ladder-type wiring diagrams for power and control wiring. Differentiate between portions of wiring that are factory-installed and portions to be field-installed.

D. Maintenance Data: Submit maintenance data and parts list for each condensing unit, control, and accessory.

1.3 STORAGE AND HANDLING

A. Handle condensing units carefully to prevent damage, denting and scoring. Do not install damaged condensing units or components; replace with new.

B. Store condensing units and components in a clean dry place. Protect from weather, dirt, water, and construction debris.

C. Do not allow condensing units or evaporators to be used as work tables during construction.

1.4 Warranty

A. Full parts and labor warranty with no exclusions other than filter changes for 5 years from the date of substantial completion

B. The compressors shall carry 4 additional years of a parts-only warranty above the basic warranty period.

PART 2 - PRODUCTS

2.1 GENERAL

A. All major components, shall be from the same manufacturer:
1. LG
2. Mitsubishi
3. Trane
4. Carrier
5. Daikin
6. Pre-approved similar and equivalent manufacturers

B. Components shall have been tested as a system and shall have approved combination ratings.

C. System(s) shall be provided with all normal components, whether specifically mentioned or scheduled, to provide a safe and fully operational system.

D. System shall use refrigerant R-410A.

2.2 FAN-COIL UNITS

A. Each fan-coil unit shall be completely compatible with the variable refrigerant system and shall be capable of independent heating or cooling mode regardless of the mode of the other units.

B. Each unit shall be equipped with an integral condensate receiver and drain with adequate lift to pump the condensate to a remote drain.

C. Blower and Drive: Blower shall be forward curved, centrifugal type, statically and dynamically balanced at the factory. Blower motor shall be variable speed, direct drive type, and shall be resiliently mounted.

D. Coil: Coil shall be corrosion-proof with aluminum fins fitted to aluminum or copper tubes. Copper tube coils shall be factory coated to prevent corrosion. Joints shall be brazed or silver soldered to be leakproof. Coil shall be factory tested under pressure to ensure leakproof construction. Coil shall corrosion-proof drain pan with drain fittings. Coil shall have brazed copper refrigerant connections.

E. Provide integral condensate pump where unit cannot gravity drain into a drainage fixture.

2.3 OUTDOOR UNIT

A. Each unit shall come from factory complete with compressor(s), fan(s) and motor(s), outdoor coil, refrigerant circuits, and control panel, all enclosed in a casing with a grille or louver for condenser coil protection.

B. Casing shall be galvanized steel with a weather resistant finish. Access panels shall be provided for power, refrigerant circuits, and outdoor fans and coils. Refrigerant circuit stubs shall extend through cabinet for easy connection.

C. Each compressor shall be hermetically sealed scroll type, internally isolated, with crankcase heater, motor overload protection, and positive lubrication. Compressors shall be resiliently mounted and be provided with crankcase heaters.

D. Coil(s) shall be seamless copper or aluminum tubes with mechanically bonded aluminum fins. Each coil shall be factory tested at 450 psig under water and thoroughly dehydrated prior to assembling into unit. Provide hail guard for outdoor coils.

E. Accessories shall include an anti-cycle timer to prevent compressor short cycling, fan relay, liquid line filter dryer, lug adapter kit for single point connection, and any options or other accessories scheduled on the drawings.

2.4 CONTROLS

A. For each fan-coil unit, provide a programmable space thermostat.

2.5 REFRIGERANT PIPING

A. Materials – Type ‘K’ hard drawn ACR copper with wrought copper brazed fittings.

B. Insulate all refrigerant lines as recommended by the equipment manufacturer with Armaflex type piping insulation.

C. Sizing - Equipment manufacturer shall review refrigerant pipe routing and shall be responsible for correct refrigerant line sizing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Outdoor Unit
1. Install outdoor unit on level reinforced concrete pads where installed on grade. Ensure that each unit is level after installation.
2. Install each outdoor unit on a minimum of four 3/8" thick neoprene pads, one at each corner.

B. Evaporator Blower
1. Install each unit per manufacturer's instructions and/or as shown on drawings.
2. Install each unit level.
   a. Install units to be suspended from structure with a rubber-in-shear vibration isolator at each threaded rod hanger.
3. Remove all shipping blocks and restraints.
4. Block off or cap or otherwise seal openings in the cabinet to prevent entry of dirt and debris until connections are made.
5. Open access panels and inspect unit for any abnormalities,
6. Make connection to primary drain connection at the drain pan and route to plumbing waste receptor or as shown on drawings.
7. Make duct connections using flexible connectors. Verify that duct is independently and adequately supported.

C. Filters :
1. Do not run unit during construction.
2. Before start-up, provide and install clean filter(s).
3. Before acceptance by Owner, provide and install clean filter(s) and also provide to the Owner at least one clean filter of each size for each evaporator blower.

D. Clean the exterior of each unit to remove dirt, debris, etc.

3.2 REFRIGERANT PIPING

A. Install refrigerant piping in strict accordance with equipment manufacturer’s instructions.

B. Test refrigeration system in accordance with A.S.M.E. B31.5. Testing pressure shall not exceed maximum rating of weakest component of system. Hold test pressure for 72 hours prior to changing.
1. Place an initial charge of refrigerant in system for detection purposes.
2. Use dry nitrogen gas for pressure testing.

C. Check all joints with an electronic leak detector.

D. Cut out any joints found to be leaky and replace with new material.

E. Clean, evacuate, and initially charge line sets and equipment in strict accordance with manufacturer’s instructions.

3.3 CHECK-OUT: After complete installation but before start-up, verify the following:

A. Fan-coil and condensing unit properly installed and level,

B. Interior of each section is clean and free of debris, dirt, loose components, etc.,

C. Correct voltage supplied,

D. Correct type and size wire, fuses, and breakers are installed,

E. Low voltage wiring correct and complete,

F. Refrigerant lines properly installed and supported.

G. Refrigerant line length accurately measured for determination of final refrigerant charge adjustment

H. Condensate drain lines correctly pitched and unrestricted,

I. Blower rotates freely and set on correct speed,

J. Clean air filter properly installed,

K. All shipping blocks, packing, shipping screws, etc. are removed.

L. All access panels and covers in place and properly secured, and

M. Thermostat set in the "off" position.

3.4 START-UP

A. Supply initial charge of refrigerant and oil.

B. Before start-up, inspect the interior of each section to verify that it is clean and free of debris, dirt, loose components, etc.. Do not attempt to start-up a dirty unit.

C. Supply service of factory-trained representative to supervise testing, dehydration, charging of units, and start-up. Authorized start-up technician shall prepare and provide a start-up report for each split system.

D. Provide start-up services per manufacturer's instructions. Provide a start-up report for each heating/cooling unit including refrigerant system, heating system, and air system. At a minimum, the start-up report shall include the following information.

1. Air Moving System - Refer to section on system test and balance,
2. Refrigerant System - refrigerant charge, in pounds,
3. Heating System
   a. ambient dry bulb temperature,
   b. air temperatures at indoor unit,
   c. entering air dry bulb,
   d. leaving air dry bulb,
   e. voltage,
   f. amperage of each leg.
4. Cooling System
   a. ambient dry bulb temperature,
   b. air temperatures at indoor unit,
   c. entering air dry bulb and wet bulb,
   d. leaving air dry bulb and wet bulb,
   e. refrigerant suction line temperature
   f. at the evaporator coil,
   g. at the condenser coil,
   h. suction and liquid refrigerant pressure at condensing coil,
   i. applied voltage and running load amps, per phase, at outdoor unit.

END OF SECTION

SECTION 26 01 00

GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 SCOPE

A. This project involves construction of the project as titled above with associated site work as shown on the plans and described herein.

1.2 DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements. Contractor shall determine exact locations from field measurements. Refer also to all architectural, structural, etc., drawings. The lack of specific detail of all offsets, transitions, etc., shall not relieve the Contractor of responsibility to provide such necessary elements to coordinate his work with building construction and with other trades.

1.3 SUBSTITUTION

A. All bids shall be based only on the equipment and materials as scheduled on the drawings and/or as specified, or on equivalent equipment and materials from a pre-approved alternative manufacturer. No bids may be based on a substitute or other alternative without specific written prior approval from the Engineer. Any Bidder who assumes equivalence of products and who bases his/her bid on that assumption, does so at their own risk.

B. A listing of approved alternative manufacturers does not mean that all products of a particular alternative manufacturer are acceptable alternatives to the scheduled items; it merely means that for bidding prior approval is not required. All fixtures and devices must still be submitted according to the prescribed procedures. In addition, some items that have an important visual affect, e.g. electric water coolers, may be required to receive Engineer's or Owner's approval also.

C. Substitute equipment, components, devices and systems shall be fully compatible with the design intent and complete with all required costs included in the bid amount. This includes all modifications to support, structure, pipe and electrical sizing and components needed and all other items necessary for the substitute to perform with no additional cost to the project.

1.4 INTENT

A. All equipment, materials and labor that may be necessary to complete work in accordance with the intent of these plans and specifications shall be furnished by the Contractor without additional cost.

B. All systems represented in the documents shall, unless specifically noted to the contrary, be provided and installed complete with all necessary components to form a complete and functioning system. Submission of bids will be considered confirmation that complete and functional systems have been included in the bids.

C. If any discrepancies or confusion is perceived in the documents, the Contractor shall call such to the attention of the Engineer for clarification of the documents prior to bidding or construction. If any inconsistencies or contradictions within the construction documents are

discovered after the construction contracts are awarded, the Engineer shall determine the intent and correct interpretation of the construction documents.

D. Contractor shall supervise and direct the work competently and efficiently and in accordance with the drawings and specifications. Contractor shall be responsible for using construction means, methods, techniques, sequences, and procedures as are compatible with the project's requirements and will result in a project completed in accordance with the requirements of the drawings and specifications.

1.5 CODES, PERMITS AND FEES

A. Contractor shall comply with all local, state and national codes and shall pay for all applicable costs, fees and permits.

1.6 CONNECTION TO UTILITIES

A. Coordinate connections to utilities directly with utility providers.

B. Verify location, size, elevation, pressure, and any other pertinent data of existing utilities. Additional costs incurred due to a failure to verify such data and to coordinate associated work with respective utility providers shall be borne by Contractor.

C. All costs associated with providing utilities including, but not limited to, connection fees, boring under roads, etc., shall be included in the Contractor's bid price whether such costs are incurred by Contractor or charged by a utility company.

D. Submission of a bid by a Contractor shall be considered an acknowledgment by the Contractor of his compliance with this section.

E. Contractor shall connect water and waste piping and gas service to existing services in accordance with utility company regulations and shall pay all applicable fees and costs. NOTE: Excavate by hand and with caution to locate all utilities prior to machine excavation. Should any service be interrupted, Contractor shall repair it immediately and at no cost to the Owner.

1.7 CONNECTION OF EQUIPMENT PROVIDED BY OTHERS

A. Provide material and labor to connect equipment, components and systems provided by the Owner or other trades.

B. Particular attention is required for food service and kitchen area equipment. Review Construction Documents describing work in those areas. Coordinate installation requirements and timing with system installers and providers.

1.8 VIBRATION AND NOISE

A. Each of the various pieces of equipment shall operate without objectionable vibration or noise. All rotating equipment shall be statically and dynamically balanced and shall be mounted, supported, and fastened so that vibration shall not exceed levels specified for the equipment item. The specific type of vibration isolation to be installed shall be submitted to the Engineer for his approval.

B. If, in the opinion of the Engineer, objectionable vibration or noise or transmission thereof to the building occurs, the Contractor shall execute remedial measures as may be necessary to eliminate such unsatisfactory operating conditions, and the work and material thereby required shall be furnished and performed at the Contractor's expense.

1.9 GUARANTEE

A. Each Contractor shall guarantee all labor and materials furnished by him for a period of one year unless otherwise noted. Guarantee period shall extend from the time of final written acceptance of the installation or upon usage by a written directive from the Owner, whichever occurs first. The guarantee shall cover the repair or replacement, without additional cost to the Owner, of any defective material or faulty workmanship.

1.10 SERVICE

A. All necessary service of each system, such as adjustment of controls, air distribution, and water balancing valves, mechanical repair of equipment, and other work requiring specialized training, shall be furnished by the Contractor, at no cost to the Owner, for a period of one year, concurrent with the warranty period specified above.

1.11 SAFETY

A. General
   1. Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work, and Contractor shall comply with all laws governing safety, specifically the "Occupational Safety and Health Standards" and the "Safety and Health Regulations for Construction", state and federal.

B. Hazardous Chemicals
   1. According to OSHA, a hazardous chemical is any chemical which is a physical hazard or a health hazard. This may include items such as paints, solvents, adhesives, sealants, cleaners, etc. If a contractor produces, uses, or stores hazardous chemicals at the workplace, then contractor shall develop, implement, and maintain a hazard communication program in compliance with latest OSHA requirements. In projects with multiple tenants in which the building is partially occupied during the project, contractor shall inform the building manager or owner, according to OSHA guidelines, of any hazardous chemicals being produced, stored, or used in the building so that other tenants may be notified. Contractor shall employ required methods of training, information, handling, ventilation, labeling, storing, disposal, and removal of hazardous chemicals.

1.12 COORDINATION

A. Each Contractor's bid shall include the necessary detail and interconnection work to coordinate his work with the work of other trades. Failure on the part of the Contractor to coordinate with all other trades resulting in interferences shall be sufficient reason to require the Contractor to replace or rebuild the work involved at no extra charge.

1.13 STORAGE OF MATERIALS

A. Each Contractor shall provide temporary storage facilities suitable for equipment stored at the job site. Storage facilities shall be rain-proof and lockable as required. Materials or equipment stored on site but not in a lockable, rain-proof storage facility shall be stored above ground or above slab. Contractor shall take necessary precautions to prevent entry of and/or damage from dirt, trash, water, or vermin. Equipment not properly stored and protected shall be, at the discretion of the Engineer, replaced at no cost to Owner. Roofs are not acceptable storage areas unless specifically allowed in writing by the Engineer.

PART 2 - PRODUCTS

2.1 SUBMITTALS

A. Provide submittal to the A/E within 45 days of commencement of the Contractor's agreement with the Owner.

B. In addition, submit specific information on equipment, products, and principal materials specified. Indicate and provide names of manufacturers, catalog and model numbers, cut sheets, and such other supplementary information as necessary for evaluation. Include all items mentioned by model number and/or manufacturer's name in the specifications or on the drawings, including but not limited to the following:
   1. Electrical - Fixtures, panels, protective devices, wiring devices, switches, motor starters, transformers, conduit, and any other equipment or principal materials.

C. Prepare and submit large scale shop drawings (minimum ¼"= 1'-0") of the central mechanical room, central electrical room and each individual electrical room. These drawings shall show to scale the actual sizes of each piece of selected mechanical, plumbing and electrical equipment along with the required clearances for maintenance or removal/replacement. Provide bottom of pipe, duct, equipment or other such vertical obstructions. Provide sections where necessary and as requested by the Engineer for clarity to describe equipment heights, piping elevations and other such clearance issues. Drawings shall be prepared on maximum 30" X 42" sheets using AutoCad® 2004 format. Submit 6 copies of the drawing sheets and a compact disk with the drawing files.

D. Requirements for submittal
   1. Each submittal shall:
      a. bear a stamp or specific written indication that Contractor has reviewed and approved all submittals prior to submission to Engineer,
      b. have all information deleted by Contractor that pertains to the means and methods of construction or to the fabrication, assembly, installation, or erection process (approval by Engineer shall not extend to these areas unless specifically noted by Engineer),
      c. be clearly marked as to which specific piece of equipment is being submitted, by use of a permanent marker, stamp, etc., so as to distinguish it from other pieces of equipment that may occur on the same page,
      d. be clearly marked as to which available options are being submitted that are associated with a piece of equipment, and
      e. be complete with respect to quantities, dimensions, specific performance, materials, and similar data to enable Engineer to review the proposed equipment.
   2. Omission by Contractor of any of the above requirements for submittals will subject submittal to automatic rejection without review.
   3. Any submittals received by Engineer that were not requested shall be returned without review of any kind.

E. Substitutions
   1. In Addition, no substitution is allowable without Engineer's written approval ten days prior to bid due date (unless otherwise allowed by Engineer) unless the manufacturer is listed on the Drawings or in the specifications as being a pre-approved alternative manufacturer. Any submittal received without such written approval or prior approval is subject to unqualified rejection.
   2. Contractor's responsibility shall be to verify that submitted substitute equipment will fit in the space available. The Contractor's submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the drawings or specifications. Any such changes shall be described in writing, briefly but completely.

3. The Contractor shall be responsible for the cost of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The cost shall be complete, that is, it shall include the costs affect on any and all other trades.
4. The Engineer may request shop drawings of mechanical rooms or systems of the substituted equipment.

F. Installation Instructions
1. For certain products or systems as identified in subsequent specification sections, the Contractor shall, as required, provide copies of manufacturer's installation instructions with the submittal. When required as such, the installation instructions are considered part of the submittal and their omission may result in automatic rejection of the submittal. Where more than one identical device is scheduled, only one set of installation instructions needs to be submitted, e.g., if seven five-ton split system air conditioners are scheduled, only one five-ton unit installation instructions need to be submitted. Similarly, if one set of installation instructions is identified by the manufacturer and on the instructions to be applicable to more than one type or size of devices, e.g., if one set of air conditioner instructions is good for three, four, and five-ton units, then only one instruction set is required for those devices.

2.2 MATERIALS

A. All materials shall be new and of the quality specified. Materials shall be free from defects. Where manufacturers' names are mentioned in these specifications or on the plans, it has been done in order to establish a standard of quality and construction.

B. Contractor will be responsible for transportation of his materials to and on the job and will be responsible for the storage and protection of his materials and work until the final acceptance of the job. At the end of each workday, each Contractor is responsible for covering or protecting his work or materials that may be susceptible to damage even if such damage is the result of unforeseen causes, e.g. an overnight thunderstorm. Failure to do so will be sufficient cause for rejection of any item in question, and any such item shall be replaced at Contractor's expense.

C. Contractor shall verify that all pieces of equipment will fit through available openings in building and that all equipment can be installed without modification of building structure.

2.3 LABELING

A. Each device for which an independent testing authority has established a standard shall have affixed a label indicating its compliance and listing. Such independent testing authorities shall include, but not be limited to, the following:

A.D.C.	Air Diffusion Council
A.G.A.	American Gas Association
A.M.C.A.	Air Movement and Control Association
A.N.S.I.	American National Standards Institute
A.R.I.	Air-Conditioning and Refrigeration Institute
A.S.H.R.A.E.	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
A.S.M.E.	American Society of Mechanical Engineers
A.S.P.E.	American Society of Plumbing Engineers
A.S.S.E.	American Society of Sanitary Engineers
A.S.T.M.	American Society for Testing and Materials
A.W.W.A.	American Water Works Association
C.T.I.	Cooling Tower Institute
F.M.	Factory Mutual
I.A.P.M.O.	International Association of Plumbing and Mechanical Officials

I.C.B.O.	International Conference of Building Officials
M.S.S.	Manufacturers Standardization Society of the Valve and Fittings Industry
N.A.P.H.C.C.	National Association of Plumbing, Heating, Cooling Contractors
N.B.S.	National Bureau of Standards
N.E.B.B.	National Environmental Balancing Bureau
N.E.C.	National Electric Code
N.E.M.A.	National Electrical Manufacturers Association
N.F.P.A.	National Fire Protection Association
N.R.C.A.	National Roofing Contractors Association
N.S.F.	National Sanitation Foundation
P.D.I.	Plumbing and Drainage Institute
S.B.C.C.I.	Southern Building Code Congress International
S.M.A.C.N.A.	Sheet Metal and Air Conditioning Contractors' National Association
T.I.M.A.	Thermal Insulation Manufacturers Association
U.L.	Underwriters Laboratory

2.4 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Contractor shall prepare and provide four copies of operating and maintenance manuals. Contractor shall deliver these four bound sets to the Engineer for approval. Each manual shall be in a ring binder and shall be indexed with dividers for each section. Delivery of required documents is a condition of final acceptance.

B. Each manual shall contain at least the following:
   1. Certificates of acceptance from inspecting authorities,
   2. Waiver of all liens,
   3. For each piece of equipment:
      a. operating and safety instructions, service manuals, and parts lists applicable to each item of equipment furnished (Contractor shall clearly distinguish in the manual between information that pertains to the particular equipment and information which does not.),
      b. nameplate data and design parameters for equipment,
      c. name, phone number, and address of vendor, manufacturer's representative, and warrantee provider,
      d. start-up report, if applicable,
   4. copies of all shop drawings and as-built drawings (as-built drawings shall be on a reproducible vellum as produced by a Xerox or photographic process),
   5. copies of all approved submittals,
   6. warranties with start dates and end dates for each piece of equipment and/or for each system (warranties shall begin on date of substantial completion and acceptance by Owner),
   7. names, phone numbers and addresses of all subcontractors, vendors, manufacturer's representatives, and warrantee providers,
   8. certification letter from each Contractor that each system furnished and installed by that Contractor and/or Subcontractors is started-up, balanced, adjusted and checked for proper operation in accordance with the intent of the contract documents, and
   9. acceptance letter from each Contractor with blanks for date of acceptance and date of expiration of warranties and guarantees.

2.5 TAGGING

A. Equipment to be Tagged: Each major piece of equipment discussed in the specifications or scheduled on the drawings shall have affixed a tag showing the name or function of that piece. The list of equipment to receive tags shall include, but not be limited to, the following:

1. panelboards, switchgear, transformers, starters, safety switches, contactors, etc., with designation from drawing and indicating function or device served (e.g. - Rm 101 lighting contactor, CHP-1, etc.),
2. motor starters and contactors, indicating which devices are being controlled,
3. any other major piece of equipment.
4. Items which have no unique name, such as light fixtures need not have tags.

B. Tags
1. Material - Tags shall be engraved plastic, brass, or anodized aluminum. Surface mounted tags shall have pressure sensitive adhesive backing. Tags for outdoor use shall be mounted with brass screws.
2. Lettering - Characters shall be minimum 1/4" in height and shall be of a contrasting color to the tag.
3. Installation - Surface mounted tags with adhesive backs shall be applied only to clean, dry surfaces. Adhesive tags shall not be applied to surfaces that are subject to condensation or excessive heat.

C. Alternatives
1. For larger equipment such as large air handlers, switchgear, etc., the use of manufactured stencils (2-inch characters) and spray paint (in contrasting color to equipment) is an acceptable alternative.
2. Individual adhesive letters are not acceptable.
3. Other alternatives are acceptable only by submitting samples or manufacturer's literature to Engineer and receiving written permission.

2.6 MOTORS AND MOTOR STARTERS

A. Motors
1. Unless scheduled otherwise, each electric motor shall be high efficiency type.
2. Each single-phase motor larger than 1/10 (one-tenth) horsepower and each single phase motor that drives a pump or compressor shall be a permanent split capacitor type. Each polyphase squirrel-cage induction motor shall be an energy efficient type as defined in NEMA document No. MG1-1987.

B. Motor Connections
1. Motor starters, unless scheduled otherwise or packaged with the equipment shall be provided and installed by the Electrical Contractor. The Mechanical Contractor or other trades shall provide to the Electrical Contractor a complete list of motors requiring starters or other connections, including power and control, and shall include the following information for each such motor:
   a. a tag reference to the piece of equipment for which the motor is needed,
   b. the voltage and number of phases,
   c. the motor requirements in terms of horsepower, running load amps, full load amps, etc.,
   d. any other pertinent information required or requested by the Electrical Contractor.
2. The Electrical Contractor shall receive and review the above information and advise the Mechanical Contractor and Engineer of any discrepancies or required modifications. The Electrical Contractor shall provide and install the correct starter, conductors, and other devices per the electrical drawings, specifications, and National Electrical Code.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. The workmanship shall, in all respects, be of the highest grade, and all construction shall be done according to the best practices of the trade. Piping, ducting and conduit shall be concealed unless otherwise noted, and installed square to the building lines. Any work not meeting this requirement shall be replaced or rebuilt without extra expense to the Owner.

3.2 INTERIM CLEANING

A. The Contractor shall maintain the work area in a clean condition during the course of the work. All debris, scrap and surplus material shall be removed from the work area on a periodic basis with a minimum of at least once per day.

B. All stored material shall be support above floor level and be protected from becoming damaged or dirty.

C. All installed material shall have open ends closed and protected from entrance of foreign material during construction.

D. Prior to enclosing an area such as a ceiling or chase wall, the installed material and surrounding area shall be thoroughly cleaned. After removing loose material, the area shall be vacuum cleaned or blown out with a portable blower to remove dust from surfaces.

3.3 CUTTING, PATCHING, AND PENETRATIONS

A. No joists, beams, girders, columns, slabs, or other structural elements shall be cut, drilled, or altered in any way by the Contractor without first obtaining written permission and instructions from the Engineer.

B. Where cutting any non-structural element(s) of walls, floors or ceilings is necessary to permit the installation of any work under this contract, or to repair any defects that may appear up to the expiration of the guarantee, such cutting shall be done by Contractor with as little damage as reasonably possible to the element being cut, to adjacent elements, or to the work of other trades.

C. After the necessary work has been completed, the damage shall be repaired by the Contractor, who shall pay all costs of such cutting and patching. All patching or sealing of cuts, penetrations, etc., including final appearance of same, shall be done to the approval of the Engineer. In absence of specific finish instructions, provide finish to match adjacent surfaces.

D. Where a penetration or cutting of a ceiling, wall, or other building membrane is required or made, each such penetration or cut shall be made neatly with a cutting tool such as a saw, sharp knife, etc., and not with an impact tool such as a hammer, screwdriver, wrench, crowbar, etc. Each such penetration or cut shall be no larger than reasonably necessary, and penetrations in occupied or publicly accessible spaces shall have a chrome-plated escutcheon installed large enough to cover the entire opening.

E. Where a penetration is made in a fire-rated building assembly (wall, floor, ceiling, floor-ceiling, roof-ceiling, etc.) or in a membrane of a fire-rated assembly, and no specific firestopping assembly is shown on Drawings, Contractor shall provide and install a firestopping assembly or product as listed in the latest edition of U.L. Fire Resistance Directory. Firestopping assembly or product shall be appropriate for the size and material of the penetrating element, for the penetrated building element, for the presence or lack of insulation, for the size of the annulus around the penetrating element, etc. Contractor shall include firestopping assembly or product in submittals. Contractor shall review and verify fire-ratings of building assemblies as shown on Architectural plans. Lack of knowledge of a fire-rating of an building assembly shall not relieve Contractor of requirement to install firestopping.

3.4 EQUIPMENT AND PIPING SUPPORTS

A. All supporting systems for piping, equipment, and materials supported by the building structure shall be submitted to the Engineer for approval prior to purchase and installation.

B. Provide 3-1/2” (minimum, or as called out elsewhere) high concrete housekeeping pads for all floor mounted equipment, conduit, and piping. Pad shall have chamfered edges and be painted to match the floor.

3.5 ACCESSIBILITY

A. Access Panels
   1. Access panels shall be provided wherever necessary for possible future replacement, adjustment, or maintenance of operating devices such as machinery, valves, dampers, switches, relays, etc., or to other critical non-operating devices such as pull boxes, inspection parts, gauges, etc. Such access panels shall be provided and installed by Contractor, whether or not shown on drawings, and shall be brought to the attention of Engineer for his approval of type, color, etc. Where access is provided in rated members, the access panels shall be of a type that maintains the integrity of the member penetrated.

B. Access to Equipment
   1. All pipes, tubing, conduit, etc., including, but not limited to, chilled water and heating water piping, domestic cold water and hot water piping, fire sprinkler piping, waste and vent piping, drain piping of any type, electrical conduit, wiring not in conduit, and pneumatic control tubing shall be installed in such a way so as not to prevent and/or not to make unreasonably difficult the removal, operation, use, or maintenance of equipment, access panels or doors, pathways (especially in attics or crawl spaces), observation ports, measurement or balancing devices, junction boxes, etc.. If access for these purposes is prevented or made unreasonably difficult in the opinion of the Engineer, then the Contractor shall make modifications or repairs at no cost to anyone except the Contractor. Such modifications or repairs shall be considered neither complete nor adequate until the Engineer are satisfied that access for the above purposes is achieved.

3.6 FIELD REPORTS

A. The Contractor shall be required to respond all deficiency items noted in Field, Site Visit, Punch List and other such reports provided by the A/E. The response shall address each deficiency item in the same order as the report with annotations as to what was done to remedy the deficiency, who performed the work and when it was done.

3.7 OPERATING TESTS

A. General
   1. After all mechanical and electrical systems have been completed and put into operation, Contractor shall subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation. All associated costs of such tests, including labor, fuel, apparatuses, piping, etc., shall be borne by the Contractor.
   2. Contractor shall make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. The Contractor shall return to the project during the first year and in the opposite season from which the system was initially operated and shall check the proper operation of the mechanical and electrical systems. Contractor shall perform any adjustments or corrective procedures required for the proper operation of all systems.

B. Notification

1. Contractor shall give the Engineer seven day's prior notification of any test so that the Engineer will have time to be present if he so desires.

C. Reports
   1. After each test is performed, the Contractor who performed the test shall prepare and issue a report to include the following information:

      a. Project name and location, date of the report,
      b. Contractor's name, address, and telephone number; if the Contractor performing the test is a Subcontractor, indicate also for whom the test is being performed, their name, address, telephone number, and a contact person's name,
      c. the date, or range of dates, of the test,
      d. the name of the Contractor's employee who was responsible for performing or for overseeing the performing of the test,
      e. a brief description of the system being tested,
      f. a brief description of the testing procedure,
      g. a summary of the test result(s),
      h. a brief assertion that the system was tested as stated and that the system complied with the requirements of the contract documents or those of the Authority Having Jurisdiction, whichever is the most stringent, and
      i. a hand-written date and signature of someone who has authority or responsibility from the company that performed test(s), and a hand-written brief note stating that the above information is true and accurate.
   2. If the tested system is tested in parts, then one report may be made after the last part is tested.
   3. The report shall be issued to the Engineer within five working days after the test is completed.
   4. Such reports shall be required of all mechanical or electrical systems which require tests for pressure, water tightness, flow, resistance, or conductivity.

D. Services of a Manufacturer's Representative
   1. Reports: For all major systems or equipment required by subsequent specifications sections to have tests or inspections by a manufacturer's representative, the manufacturer's representative shall prepare a written report to be sent to the Engineer for subsequent distribution to the Engineer, Owner, General Contractor, and to whomever else the Engineer deems necessary. The report shall include at least the following:
      a. date of the visit, name and title of the representative, name and location of the project,
      b. name and title of any observers,
      c. a brief description of the equipment being inspected and/or tested,
      d. a brief discussion of the quality of the installation including any important items (in the manufacturer's experience) that were done correctly, as well as any items that were done incorrectly or not to recommendations,
      e. a list of tests and/or inspections performed and the results of same, and
      f. a brief statement of whether the installation conforms to manufacturer's recommendations and/or requirements, and if not what is required to bring the installation into conformance.
   2. Deficiencies and Defects
      a. Contractor shall be responsible for providing all labor and materials, at no cost to anyone except Contractor, to correct any deficiencies or defects reported by manufacturer's representative.
      b. If, in the opinion of the manufacturer's representative, the deficiencies and defects are sufficiently serious, then Contractor shall arrange for, and bear all costs of, another inspection by manufacturer's representative after corrective measures have been taken.

3. The above process shall continue until the manufacturer's representative approves the installation.

3.8 INSTRUCTIONS FOR OWNER

A. Contractor shall instruct the Owner's operating personnel in the operation and maintenance of all mechanical equipment. Contractor shall furnish any special servicing tools required for maintenance.

3.9 DEMONSTRATION

A. Contractor shall conduct a demonstration of the installation upon completion of the work. Prior to this, all work shall have been completed, tested, balanced, and placed in operation. Qualified persons must be present at demonstration to operate all systems and prove the performance of the equipment. The schedule for this demonstration shall be coordinated with the Engineer.

3.10 CLEANUP

A. At substantial completion of the project, thoroughly clean all equipment and systems of all dirt, debris and foreign material.

B. This shall include cleaning coils and fans inside of air handlers, cleaning the interior of duct systems and wiping down the interior of all electrical equipment.

C. Remove all unused temporary wiring or construction lighting and power and all unused material from above the ceilings and from hidden recesses.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes building wire and cable; nonmetallic-sheathed cable; direct burial cable; service entrance cable; armored cable; metal clad cable; and wiring connectors and connections.

B. Related Sections:
1. Section 26 05 53 - Identification for Electrical Systems: Product requirements for wire identification.

1.2 REFERENCES

A. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:
1. Solid copper conductor for feeders and branch circuits 12 AWG and smaller.
2. Stranded copper conductors for control circuits.
3. Stranded copper conductors larger than 12 AWG.
4. Conductor not smaller than 12 AWG for power and lighting circuits.
5. Conductor not smaller than 16 AWG for control circuits.
6. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
7. 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

B. Wiring Methods: Provide the following wiring methods:
1. Concealed Dry Interior Locations: Use only building wire THHN/THWN insulation, in raceway.
2. Concealed Dry Interior Locations: For lighting whips and drops to single outlet or switch and within wall cavities THHN/THWN insulation with grounding strip for exterior of metal clad cable and green insulated ground wire complying with NEC requirements may be used at contractor’s option.
3. Exposed Dry Interior Locations: Use only building wire THHN/THWN insulation, in raceway.
4. Wet or Damp Interior Locations: Use only building wire THHN/THWN insulation, in raceway.
5. Exterior Locations: Use only building wire THHN/THWN insulation, in raceway.
6. Underground Locations: Use only building wire THHN/THWN insulation, in raceway.

1.4 SUBMITTALS

A. Section 26 01 00 - Submittal Procedures: Requirements for submittals.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and circuits.

1.6 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on Drawings.

1.7 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

B. Wire, conduit and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 10 ft of length shown.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Product Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation: 600 volt rating; thermoplastic material rated 90 degrees C.

2.2 METAL CLAD CABLE

A. Conductor: Copper.

B. Insulation Voltage Rating: 600 volts.

C. Insulation Temperature Rating: 90 degrees C.

D. Insulation Material: Thermoplastic.

E. Insulated green grounding conductor.

F. Armor Design: Interlocked metal tape.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify interior of building has been protected from weather.

B. Verify mechanical work likely to damage wire and cable has been completed.

C. Verify raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION

A. Route wire and cable to meet Project conditions.

B. Neatly train and lace wiring inside boxes, equipment, and panelboards.

C. Identify and color code wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

D. Special Techniques--Building Wire in Raceway:
   1. Pull conductors into raceway at same time.
   2. Install building wire 4 AWG and larger with pulling equipment.

E. Special Techniques - Cable:
   1. Protect exposed cable from damage.
   2. Support cables above accessible ceiling, using spring metal clips to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
   3. Use suitable cable fittings and connectors.

F. Special Techniques - Wiring Connections:
   1. Clean conductor surfaces before installing lugs and connectors.
   2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
   3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
   4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
   5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
   6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

G. Install solid conductor for feeders and branch circuits 12 AWG and smaller.

H. Install stranded conductors for branch circuits 10 AWG and larger. However, when stranded conductors are used in lieu of solid, then install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

3.4 WIRE COLOR

A. General
   1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following – unless governed by other local code amendments:
      a. Black and red for single phase circuits at 120/240 volts.
      b. Black, red and blue for circuits at 120/208 volts single or three-phase.
      c. Purple, brown, and yellow for circuits at 277/480 volts single or three-phase.
   2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices, and boxes. Colors are as follows:

a. Black and red for single phase circuits at 120/240 volts.
b. Black, red, and blue for circuits at 120/208 volts single or three-phase.
c. Purple, brown, and yellow for circuits at 277/480 volts single or three-phase.

3. If there is a local code stating wire color, the local code shall supersede.

B. Neutral Conductors: White 120/208 volts, neutral gray 277/480 volts. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.

C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.

D. Feeder Circuit Conductors: Uniquely color code each phase.

E. Ground Conductors:
1. For 6 AWG and smaller: Green.
2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Firestopping relating to electrical work.
5. Firestopping accessories.
6. Equipment bases and supports.

1.2 REFERENCES

A. ASTM International:
1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

B. FM Global:
1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

C. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.

D. Underwriters Laboratories Inc.:
1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
5. UL - Fire Resistance Directory.

E. Intertek Testing Services (Warnock Hersey Listed):
1. WH - Certification Listings.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SUBMITTALS

A. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

B. Product Data:
   1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
   2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

C. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.

D. Design Data: Indicate load carrying capacity of trapeze hangers.

E. Manufacturer's Installation Instructions:
   1. Hangers and Supports: Submit special procedures and assembly of components.
   2. Firestopping: Submit preparation and installation instructions.

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

G. Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

A. Manufacturers:
   1. Allied Tube & Conduit Corp.
   2. Electroline Manufacturing Company
   3. B-Line
   4. Unistrut
   5. Power Strut
   6. Kindorf

B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads. Minimum diameter 3/8 inch.

C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

E. Conduit clamps - general purpose: One-hole malleable iron for surface mounted conduits.

F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

2.2 FORMED STEEL CHANNEL

A. Manufacturers:
1. Allied Tube & Conduit Corp.
2. B-Line Systems
3. Midland Ross Corporation, Electrical Products Division.
4. Unistrut Corp.
5. Powerstrut
6. Kindorf

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.3 SPRING STEEL CLIPS

A. Product Description: Mounting hole and screw closure.

2.4 FIRESTOPPING

A. Manufacturers:
1. Dow Corning Corp.
2. Fire Trak Corp.
3. Hilti Corp.
4. International Protective Coating Corp.
5. 3M fire Protection Products.
6. Specified Technology, Inc.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Single component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

2.5 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:
   1. Mineral fiberboard.
   2. Mineral fiber matting.
   3. Sheet metal.
   4. Plywood or particle board.
   5. Alumina silicate fire board.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:
   1. Furnish UL listed products or products tested by independent testing laboratory.
   2. Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:
   1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
   2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install backing and damming materials to arrest liquid material leakage.

D. Obtain permission from Contacting Officer before using powder-actuated anchors.

E. Do not drill or cut structural members.

3.3 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:

1. Concrete Structural Elements: Provide precast inserts, expansion anchors and preset inserts.
2. Steel Structural Elements: Provide beam clamps and spring steel clips.
3. Concrete Surfaces: Provide expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Install conduit and raceway support and spacing in accordance with NEC.

C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

D. Install multiple conduit runs on common hangers.

E. Supports:
1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
4. Support vertical conduit at every other floor.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
   2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
   3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).

B. National Electrical Manufacturers Association:
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
   3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
   4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
   5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
   6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
   7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

A. All wiring shall be in conduit unless specifically noted otherwise.

B. All conduit shall be concealed behind walls, below floors, below roof and above ceilings unless the space is an unfinished area or utility space such as a mechanical or electrical room or unless specifically noted otherwise.

C. All conduit shall be run above slab unless specifically shown on the drawings or described otherwise.

D. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

1.4 DESIGN REQUIREMENTS

A. Minimum Raceway Size: ½ inch unless otherwise specified.

1.5 SUBMITTALS

A. Product Data: Submit for the following:
   1. Flexible metal conduit.
   2. Liquidtight flexible metal conduit.
   3. Nonmetallic conduit.
   4. Flexible nonmetallic conduit.
   5. Nonmetallic tubing.
   6. Raceway fittings.
   7. Conduit bodies.
   8. Surface raceway.
   9. Wireway.
   10. Pull and junction boxes.
   11. Handholes.

B. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents:

   1. Record actual routing of conduits larger than 2 inches.
   2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC conduit from sunlight.

1.8 COORDINATION

A. Coordinate location of boxes and devices with architectural elevations and shop drawings of mill and casework.

B. Coordinate mounting heights, orientation, and locations of outlets mounted above counters, benches, and backsplashes.

C. Coordinate switch locations with door swings.

PART 2 - PRODUCTS

2.1 METAL CONDUIT

A. Rigid Steel Conduit (RMC-S): ANSI C80.1.

B. Rigid Aluminum Conduit (RMC-A): ANSI C80.5.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.2 PVC COATED METAL CONDUIT

A. Product Description: NEMA RN 1; rigid steel conduit (RMC-S) with external PVC coating, 20 thick.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Product Description: (FMC) Interlocked steel construction.

B. Fittings: ANSI/NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Product Description: (LFMC) Interlocked steel or aluminum construction with PVC jacket.

B. Fittings: ANSI/NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel, compression or set screw indenter type.

C. Provide connectors with insulated throat.

2.6 NONMETALLIC CONDUIT

A. Product Description: NEMA TC 2; Schedule 40 PVC (RNC-40) and Schedule 80 PVC (RNC-80).

B. Fittings and Conduit Bodies: NEMA TC 3.

2.7 WIREWAY

A. Product Description: General purpose and Raintight type wireway.

B. Knockouts: None.

C. Size: as indicated on Drawings.

D. Cover: Screw cover.

E. Connector: Slip-in.

F. Fittings: Lay-in type with removable top, bottom, and side; captive screws and drip shield.

G. Finish: Rust inhibiting primer coating with gray enamel finish.

2.8 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Minimum 4”x 4”x 2-1/8” deep
   2. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
   3. Concrete Ceiling Boxes: Concrete type.
   4. Provide boxes installed inside wall cavities with back brace to prevent deflection of box away from finished wall surface.
   5. Provide plaster rings of correct depth to match wall thickness and finishes. Verify wall and finish thickness from Architectural documents prior to installation. Wiring devices shall be snuggly attached to boxes. Wiring devices supported by plaster ears of the device or field made spacers will not be acceptable. Remedy of this situation will require removal and replacement of the plaster ring with one of proper depth and repair of the wall and finishes.

B. Nonmetallic Outlet Boxes: NEMA OS 2.

C. Cast Floor Boxes: NEMA FB 1, Type FD, aluminum or cast feralloy. Furnish gasketed cover by box manufacturer.

D. Wall Plates for Finished Areas: As specified in Section 26 27 26.

E. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.9 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 26 27 16.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
   1. Material: Galvanized cast iron or Cast aluminum.
   2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

D. In-Ground Cast Metal Box: NEMA 250, Type 6, flanged, recessed cover box for flush mounting:
   1. Material: Galvanized cast iron or Cast aluminum.
   2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
   3. Cover Legend: "ELECTRIC".

E. Fiberglass Handholes: Die-molded, glass-fiber [concrete composite] hand holes:
   1. Cable Entrance: Pre-cut 6 inch x 6 inch cable entrance at center bottom of each side.
   2. Cover: Glass-fiber, weatherproof cover with nonskid finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 APPLICATION - RACEWAY

A. Dry Locations, Concealed within or suspended under building:
   1. EMT.
   2. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas.
   3. Provide hinged enclosure for large pull boxes.

B. Wet and Damp Locations, Concealed within or suspended under building:
   1. RMC-S, RMC-A or IMC.
   2. Provide cast metal or nonmetallic outlet, pull, and junction boxes.

C. Exposed within building
   1. Below 8’-0” above finished floor: RMC-S, RMC-A or IMC.
   2. Above 8’-0”: EMT
   3. Provide sheet-metal boxes.
   4. Provide flush mounting outlet box in finished areas.
   5. Provide hinged enclosure for large pull boxes.

D. Exposed exterior to building:
   1. Exposed areas:
      a. RMC-S, RMC-A, or IMC.
      b. Provide cast metal or nonmetallic outlet, pull, and junction boxes.

E. Connections to equipment:
   1. Within building or suspended under building: FMC
   2. Exterior to building: LFMC
   3. Length of connector: 3’-0” maximum unless noted otherwise.

3.3 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 26 05 26.

B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.

C. Identify raceway and boxes in accordance with Section 26 05 53.

D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

B. Do not install raceway underground or under-slab unless specifically noted otherwise.

C. Arrange raceway supports to prevent misalignment during wiring installation.

D. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29.

F. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports.

G. Do not attach raceway to ceiling support wires or other piping systems.

H. Construct wireway supports from steel channel specified in Section 26 05 29.

I. Route exposed raceway parallel and perpendicular to walls.

J. Route raceway installed above accessible ceilings parallel and perpendicular to walls.

K. Route conduit in and under slab from point-to-point.

L. Maintain clearance between raceway and piping for maintenance purposes.

M. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.

N. Cut conduit square using saw or pipe cutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.

Q. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

R. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install hydraulic one-shot bender to fabricate bends in metal conduit larger than 2 inch size.

S. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.

T. Install fittings to accommodate expansion and deflection where raceway crosses control and expansion joints.

U. Install insulated bushings or insulated throat bushings at all connections to boxes, fixtures, equipment or other devices and terminations.

V. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

W. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

X. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

Y. Close ends and unused openings in wireway.

3.5 INSTALLATION - BOXES

A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings or as indicated in architectural elevations. Receptacles shall be mounted at 18” and switches at 48” to center AFF if not otherwise noted.

B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.

C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26 or as indicated in Architectural elevations.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches of separation. Install with minimum 24 inches of separation in acoustic rated walls.

H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

I. Install stamped steel bridges to fasten flush mounting outlet box between studs.

J. Provide proper bridging or back-of-box support so that there is no deflection in the box when operating a switch or plugging in a cord cap. Inadequately supported boxes and devices shall be removed, repaired and refinished.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Install adjustable steel channel fasteners for hung ceiling outlet box.

M. Do not fasten boxes to ceiling support wires or other piping systems.

N. Support boxes independently of conduit.

O. Install gang box where more than one device is mounted together. Do not use sectional box.

P. Install gang box with plaster ring for single device outlets.

Q. All boxes shall be mounted so that the devices and cover plates are flush to the walls, plumb and level with adjacent devices. If devices are not plumb, the box shall be removed and straightened. Any finishes damaged shall be repaired to the satisfaction of the Contacting Officer.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.

B. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.

C. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused openings in boxes.

3.8 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes field applied:
   1. Nameplates.
   2. Labels.
   3. Wire markers.
   4. Conduit markers.
   5. Stencils.
   6. Lockout Devices.

1.2 REFERENCES

A. NFPA 70 – National Electrical Code

1.3 SUBMITTALS

A. Product Data:
   1. Submit manufacturer’s catalog literature for each product required.
   2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

B. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept identification products on site in original containers. Inspect for damage.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Product Description:
   1. Laminated three-layer plastic with engraved black letters on white contrasting background color.

B. Letter Size:
   1. 1/8 inch high letters for identifying individual equipment and loads.
   2. 1/4 inch high letters for identifying grouped equipment and loads.

C. Minimum nameplate thickness: 1/8 inch.

2.2 WALL PLATE IDENTIFICATION

A. Section 26 27 26 – Wire Devices: Cover plate identification.

2.3 WIRE MARKERS

A. Description: Cloth tape, split sleeve, or tubing type wire markers.

B. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.
   2. Control Circuits: Control wire number as indicated on Drawings.

2.4 CONDUIT AND RACEWAY MARKERS

A. Description: Labels fastened with adhesive or Stencils.

B. Color:
   1. 480 Volt System: Red lettering on white background.
   2. 208 Volt System: Black lettering on white background.

C. Legend:
   1. 277/480 Volt System: HIGH VOLTAGE.
   2. 208 Volt System: 208 VOLTS.

2.5 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. Up to 2 inches Outside Diameter of Raceway: 1/2 inch high letters.
   2. 2-1/2 to 6 inches Outside Diameter of Raceway: 1 inch high letters.

B. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors conforming to the following:
   1. Black lettering on white background.
   2. White lettering on gray background.
   3. Red lettering on white background for emergency circuits.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplate Installation:
   1. Install nameplate parallel to equipment lines.
   2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
   3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
   4. Secure nameplate to equipment front using screws or rivets.
   5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
   6. Install nameplates for the following:
      a. Switchboards.
      b. Panelboards.
      c. Transformers.
      d. Service Disconnects.
      e. Equipment Disconnects.
      f. Starters.
      g. Equipment Controllers (VFD, Contactors, etc.)

C. Label Installation:
   1. Install label parallel to equipment lines.
   2. Install labels for permanent adhesion and seal with clear lacquer.

D. Wire Marker Installation:
   1. Install wire marker for each conductor at panelboard gutters, pull boxes, and each load connection.
   2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.

E. Raceway Marker Installation:
   1. Install raceway marker for each conduit or raceway longer than 20 feet.
   2. Raceway Marker Spacing: 20 feet on center.
   3. Raceway Painting: Identify conduit using field painting in accordance with Section 09 90 00
      a. Paint colored band on each conduit longer than 20 feet.
      b. Paint bands 20 feet on center.
      c. Color:

1) 480 Volt System: Blue.
2) 208 Volt System: Yellow.

F. Stencil Installation:
1. Apply stencil painting in accordance with architectural painting Section.

END OF SECTION

SECTION 26 51 01

LIGHTING

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install all labor and materials as required for complete and working lighting system including:
   1. Light Fixtures

1.2 GENERAL

A. Provide interior lighting fixtures and emergency lighting units that have been UL listed and labeled.

1.3 SUBMITTALS

A. Submit manufacturer's data on lighting fixtures, lamps, and ballasts.
   1. Include electrical ratings and photometric data with certified results of independent laboratory tests.
   2. Include data on batteries of emergency lighting units.

B. Submit dimensioned drawings of lighting fixtures. Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in order of luminaire "Type" designation with proposed fixture and accessories clearly indicated on each sheet.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

A. Provide lighting fixtures and components of sizes, types, and ratings as indicated on drawings and listed in fixture schedule, complete with drivers, ballasts, lamps, starters, suspension accessories, canopies, hickey, casings, sockets, lamp holders, frames, housings, and wiring. Verify type and fire-rating of actual ceiling suspension system to be installed by Ceiling Contractor prior to ordering fixtures. If fixture type designation is omitted, fixture shall be same type as scheduled for rooms of similar usage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures shall be installed in symmetrical patterns with ceiling grids, partitions, air devices, speakers, etc. Locations shown on electrical drawings are of a general nature and shall not be scaled for location. Contractor shall refer to Architectural reflected ceiling plans for specific locations of light fixture locations.

B. Fixtures shall be installed in neat, workmanlike appearance. Recessed fixtures shall have trims or frames installed "snug" to ceilings; surface mounted fixtures shall have housings

installed "snug" to ceilings and plumb; stem mounted fixtures shall have stems installed plumb.

C. Clean fixtures of dirt and debris upon completion of installation. Protect fixtures already installed, from damage during remainder of construction.

D. Recessed lighting fixtures shall have four (4) tie wires on each fixture (one at each corner) connected to structure. Connection to other systems is not acceptable. Tie wires shall be galvanized steel, as used for suspending ceiling tiles.

E. Upon completion of installation of lighting fixtures, and after building circuitry is energized, apply energy to demonstrate compliance with requirements. Correct malfunctioning units and replace defective lamps, then retest.

END OF SECTION