

SECTION 072435 - ARCHITECTURAL FOAM SHAPES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Architectural Foam Shapes.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each component.
- B. Samples: For each exposed product and for each color and texture specified, 8 inches square in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturer Certificates: Signed by manufacturer certifying the following:
 - 1. Substrate is acceptable to manufacturer.
- B. Product Certificates: For cementitious materials insulation.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution, and to set quality standards for fabrication and installation.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Maintain ambient temperatures above 40 deg F for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit foam shapes to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1.8 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace foam shapes that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Bond integrity and weathertightness.
 - b. Deterioration of finishes beyond normal weathering.
 2. Warranty coverage includes the following components:
 - a. Finish, including base and finish coats and reinforcing mesh.
 - b. Insulation.
 - c. Insulation adhesive and mechanical fasteners.
 3. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. Company A, Inc.
 2. Company B, Inc.
 3. Company C, Inc.
 4. Company D, Inc.
- B. Source Limitations: Obtain components from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

1. Impact Performance: ASTM E 2568, High impact resistance.
2. Bond Integrity: Free from bond failure within between foam shapes and substrates, resulting from exposure to fire, wind loads, weather, or other in-service conditions.

3. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch clean glass substrate; cured for 28 days and shows no growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274.
 - a. Wind Loads: Uniform pressure as indicated on Drawings.

2.3 MATERIALS

- A. Adhesive: Manufacturer's standard formulation designed for indicated use; compatible with substrate.
- B. Molded, (Expanded) Rigid Cellular Polystyrene Board Insulation (EPS): Comply with ASTM C 578, Type I; and with manufacturer's requirements for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
 1. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks.
 2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, according to ASTM E 84.
 3. Foam Build-Outs: Provide with profiles and dimensions indicated on Drawings.
- C. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. according to ASTM E 2098 and the following:
 1. Reinforcing Mesh, General: Not less than weight required to meet impact-performance level specified in "Performance Requirements" Article.
- D. Base-Coat Materials: Manufacturer's standard mixture complying with one of the following:
 1. Job-mixed formulation of portland cement complying with ASTM C 150/C 150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
 2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
 3. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.
 4. Factory-mixed noncementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.
- E. Primer: Manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.
- F. Finish-Coat Materials: Manufacturer's standard acrylic-based coating with enhanced mildew resistance complying with the following:
 1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
 - a. Colors: Match Architect's sample.
 - b. Textures: Match Architect's sample.
- G. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.

- H. Water: Potable.

2.4 FABRICATION

- A. Foams Shapes shall be pre-fabricated and delivered to the project site ready for installation.

2.5 MIXING

- A. Comply with manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by manufacturer. Mix materials in clean containers. Use materials within time period specified by manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Begin coating application only after surfaces are dry.
 - 2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect foam shapes, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind foam shapes and deterioration of substrates.
- C. Prepare and clean substrates to comply with manufacturer's written instructions to obtain optimum bond between substrate and adhesive for foam shapes.
 - 1. Concrete Substrates: Provide clean, dry, neutral-pH substrate for insulation installation. Verify suitability of substrate by performing bond and moisture tests recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Comply with ASTM C 1397, ASTM E 2511, and manufacturer's written instructions for installation of foam shapes as applicable to each type of substrate.

3.4 INSTALLATION

- A. Install Foam shapes on top of the top coat of the cement plaster (stucco).
- B. Adhesively attach insulation to substrate in compliance with ASTM C 1397 and the following:
 - 1. Sheathing: Apply adhesive to foam shapes in a manner that results in coating the entire surface of sheathing with adhesive once insulation is adhered to substrate.
 - 2. Press and slide foam shapes into place. Apply pressure over the entire surface of foam shape to accomplish uniform contact, high initial grab, and overall level surface.
 - 3. Allow adhered foam shapes to remain undisturbed for not less than 24 hours, before beginning rasping and sanding insulation or before applying base coat and reinforcing mesh.
 - 4. Apply foam shapes over dry substrates.
 - 5. Abut insulation tightly at joints within and between each foam shape to produce flush, continuously even surfaces without gaps or raised edges.
 - 6. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
 - 7. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch. Prevent airborne dispersal and immediately collect insulation raspings or sandings.
 - 8. Interrupt foam shapes for expansion joints where indicated.
 - 9. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
 - 10. Fully wrap edges with strip reinforcing mesh.
 - 11. Treat exposed edges of insulation by encapsulating with base coat, reinforcing mesh, and finish coat.
- C. Expansion Joints: Install at locations indicated, where required by manufacturer, and as follows:
 - 1. At expansion joints in substrates.
 - 2. Where foam shapes adjoin dissimilar substrates, materials, and construction, including other foam shapes.

3.5 BASE-COAT INSTALLATION

- A. Base Coat: Apply to exposed surfaces of foam shapes in minimum thickness recommended in writing by manufacturer, but not less than 1/16-inch dry-coat thickness.
- B. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.

3.6 FINISH-COAT INSTALLATION

- A. Primer: As recommended, apply over dry base coat according to manufacturer's written instructions.

- B. Finish Coat: Apply over dry base coat and primer if required, maintaining a wet edge at all times for uniform appearance, in thickness required by manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
- C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by manufacturer.

3.7 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive foam shapes.

END OF SECTION 072435

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Building paper.
 - 2. Building wrap.
 - 3. Flexible flashing.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- A. Shop Drawings: Show details of building wrap at terminations, openings, and penetrations. Show details of flexible flashing applications. Include project specific details reviewed and approved by the Manufacturer.
- B. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

1.3 WARRANTY

- A. Provide Manufacturers Standard Product and Labor warranty.
 - 1. Warranty Term: (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Paper: Water-vapor-permeable, asphalt-saturated kraft building paper that complies with ICC-ES AC38, Grade D; except with water-resistance rating not less than 1 hour.
- B. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Building Innovations: E. I. du Pont de Nemours and Company; Commercial Wrap "D" or a comparable product by one of the following:
 - a. Ludlow Coated Products; Barricade Plus.
 - b. Reemay, Inc; Metrowrap.
 - 2. Water-Vapor Permeance: Not less than 50 g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).

- C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.
- D. Staples with capped heads or disc caps: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

2.2 MISCELLANEOUS MATERIALS

- A. Flashing: Self-adhesive butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 40 Mils.
 - 1. Provide Manufacturer's standard flexible flashing and components. At openings 9-inches wide at the sill and 6-inches wide at jambs and head.
 - 2. Provide Quickflash flashing at round wall penetrations such as but not limited to; HVAC or exhaust ducts.
- B. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.
- C. Sealant at interior face of windows to be installed; Refer to Section 079200 "Sealants."

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover sheathing with water-resistive barrier as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.
- C. Building Wrap: Comply with manufacturer's written instructions.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 2. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 3. Lap water-resistive barrier over flashing at heads of openings.

END OF SECTION 072500

SECTION 074113 – METAL ROOFING PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Standing-seam metal roof panels.

1.2 SUBMITTALS

- A. Product Approval: Submit current Product Approval documentation in accordance with the Florida Building Code.
- B. Product Data: For each type of product.
- C. Shop Drawings: For sheet metal roofing.
 - 1. Show installation layouts, expansion joint locations, fixed points, and keyed details. Distinguish between shop- and field-assembled work.
 - 2. Include pattern of seams and details of termination points, expansion joints, and direction of expansion, roof penetrations, edge conditions, special conditions, and connections to adjoining work.
- D. Samples: For each exposed product and for each color and texture specified.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: The Contractor shall engage an experienced installer who has completed metal roof panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance for a minimum of 5 years.

1.4 WARRANTY

- A. Special Warranty: Warranty in which Installer agrees to repair or replace components of sheet metal roofing that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Sheet metal roofing system including, but not limited to, metal roof panels, cleats, anchors and fasteners, sheet metal flashing integral with sheet metal roofing, fascia panels, trim, underlayment, and accessories, shall comply with requirements without failure due to defective manufacture, fabrication, or installation, or due to other defects in construction. Sheet metal roofing shall remain watertight.
 1. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.
- B. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or indicated on Drawings.
- C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 1. Wind Loads: As indicated.
- D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- F. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- G. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

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. Berridge.
 - b. Firestone.
 - c. MBCI
 - d. Petersen Aluminum Corporation.
2. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Nominal Thickness: 0.032 inch.
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
3. Clips: One-piece fixed to accommodate thermal movement.
 - a. Material: 0.062-inch-thick, stainless-steel sheet.
4. Panel Coverage: 16 inches.
5. Panel Height: 1.5 inches.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Polyguard Products, Inc.; Deck Guard HT.
 - e. Protecto Wrap Company; Protecto Jiffy Seal Ice & Water Guard HT.
 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
 4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Polyguard Products, Inc.; Deck Guard HT.
 - e. Protecto Wrap Company; Protecto Jiffy Seal Ice & Water Guard HT.

5. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
6. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete roofing system and as recommended by primary sheet metal manufacturer unless otherwise indicated.
- B. Fasteners: Series 304 stainless steel.

2.5 ACCESSORIES

- A. Sheet Metal Accessories: Provide components required for complete sheet metal roofing assembly including trim, copings, fasciae, corner units, clips, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items. Match material and finish of sheet metal roofing unless otherwise indicated.
 1. Cleats: Intermittent and continuous attachment devices for mechanically seaming into joints and formed from the following materials and thicknesses unless otherwise indicated:
 2. Expansion-Type Cleats: Cleats of a design that allows longitudinal movement of roof panels without stressing panel seams; of same material as other cleats.
 3. Backing Plates: Plates at roofing splices, fabricated from material recommended by SMACNA.
 4. Flashing and Trim: Formed from same material and with same finish as sheet metal roofing, minimum 0.018 inch thick.

2.6 FABRICATION

- A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.7 FINISHES

A. Aluminum Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that tops of fasteners are flush with surface.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply at locations indicated on Drawings in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. General: Install sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to installation characteristics required unless otherwise indicated on Drawings. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required for complete roofing system and as recommended by fabricator for sheet metal roofing.
 1. Install sheet metal roofing true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement.

3. Field cutting of sheet metal roofing by torch is not permitted.
 4. Provide metal closures at peaks rake edges rake walls eaves and each side of ridge and hip caps.
 5. Flash and seal sheet metal roofing with closure strips at eaves, rakes, and perimeter of all openings. Fasten with self-tapping screws.
 6. Locate and space fastenings in uniform vertical and horizontal alignment. Predrill panels for fasteners.
 7. Install ridge and hip caps as sheet metal roofing work proceeds.
 8. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid four-panel lap splice condition. Install backing plates at roofing splices.
 9. Lap metal flashing over sheet metal roofing to direct moisture to run over and off roofing.
- B. Thermal Movement: Rigidly fasten metal roof panels to structure at only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction.
1. Point of Fixity: Fasten each panel along single line of fixing located at eave.
 2. Avoid attaching accessories through roof panels in manner that inhibits thermal movement.
- C. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
1. Aluminum Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- D. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by sheet metal manufacturer or SMACNA.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

3.4 CLEANING AND PROTECTING

- A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION 074113

SECTION 074646 - FIBER-CEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fiber-cement siding, fascia, soffit and trim.

1.2 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For fiber-cement siding and soffit including related accessories.
- C. Samples for Verification: For each type, color, texture, and pattern required.
 - 1. 12-inch-long-by-actual-width Sample of siding.
 - 2. 24-inch-wide-by-36-inch-high Sample panel of siding assembled on plywood backing.
 - 3. 12-inch-long-by-actual-width Sample of soffit.
 - 4. 12-inch-long-by-actual-width Samples of trim and accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of fiber-cement siding and soffit.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
- C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Build mockups for fiber-cement siding including accessories.
 - a. Size: 48 inches long by 60 inches high.
 - b. Include outside corner on one end of mockup and inside corner on other end.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking and deforming.
 - b. Deterioration of materials beyond normal weathering.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

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. CertainTeed Corporation.
 - b. James Hardie Building Products, Inc.
 - c. Nichiha Fiber Cement.
 - d. Norandex Building Materials Distribution, Inc.
- B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- C. Nominal Thickness: Not less than 5/16 inch.
- D. Horizontal Pattern: Boards Size as indicated on the drawings.
 1. Texture: Match Architect's sample.
- E. Panel with Battens: Panel Texture: 48-inch-wide sheets.
 1. Texture: Match Architect's sample.
- F. Factory Priming: Manufacturer's standard acrylic primer.

2.3 FIBER-CEMENT SOFFIT AND TRIM

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Nichiha Fiber Cement; or a comparable product by one of the following:
 - a. CertainTeed Corporation.
 - b. James Hardie Building Products, Inc.
 2. Color: As Selected by Architect from Manufacturer full range.
- B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- C. Nominal Thickness: Not less than 5/16 inch.
 1. Refer to drawings for sizes indicated.
 - a. Texture: Match Architect's sample.
 2. Factory Priming: Manufacturer's standard acrylic primer.

2.4 FIBER CEMENT FASCIA

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Nichiha Fiber Cement.
 - b. CertainTeed Corporation.
 - c. James Hardie Building Products, Inc.
 - 2. Fascia board size: 5/4-inch x height indicated.
 - 3. Panel Texture: Match Architect's Sample.
 - 4. Factory Priming: Manufacturer's standard acrylic primer.

2.5 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
 - 1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
 - 1. Finish for Aluminum Flashing: High-performance organic finish.
- C. Rain Screen; Basis of Design Product and Manufacturer; Slicker Max, Benjamin Obdyke Inc.
- D. Fasteners:
 - 1. For fastening to wood, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch into substrate.
 - 2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
 - 3. For fastening fiber cement, use hot-dip galvanized fasteners.
- E. Continuous Soffit Vents: Aluminum, hat-channel shape, with perforations; 2 inches wide and not less than 96 inches long.
 - 1. Net-Free Area: As Indicated.
 - 2. Finish: Factory primed.
- F. Reveal Accessories:
 - 1. Horizontal Trim: Basis of Design Product and Manufacturer; Tamlyn, model RH16.
 - a. Depth: Match overall installed siding thickness.
 - b. Color: As selected by architect from Manufacturers full range.
- G. Reveal Accessories:

1. Vertical Trim: Basis of Design Product and Manufacturer; Tamlyn, model RV16.
 - a. Depth: Match overall installed siding thickness.
 - b. Color: As selected by architect from Manufacturers full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and soffit and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 1. Do not install damaged components.
 2. Install fasteners no more than 24 inches o.c.
- B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.
- C. Seal all cut edges with factory sealer per product manufacturer requirements

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

1.2 SUBMITTALS

- A. Product Approval: Submit current Product Approval documentation in accordance with the Florida Building Code.
- B. Product Data: For each type of product.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
- D. Samples for Verification: For the following products:
 1. Sheet roofing, of color required.
 2. Walkway pads or rolls, of color required.

1.3 QUALITY ASSURANCE

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

1.4 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2. Firestone Building Products.
3. GAF Materials Corporation.
4. Johns Manville.

2.2 PERFORMANCE REQUIREMENTS

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

2.3 TPO ROOFING

- A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible TPO sheet.
 1. Thickness: 60 mils, nominal.
 2. Exposed Face Color: White.

2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Bonding Adhesive: Manufacturer's standard.
- D. Slip Sheet: Manufacturer's standard, of thickness required for application.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.
- F. Miscellaneous Accessories: Provide metal termination bars, metal battens, pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 ROOF INSULATION

- A. Molded-Polystyrene Board Insulation: ASTM C 578, Type II, 1.35-lb/cu. ft. minimum density.
 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. Carlisle SynTec Incorporated.
 - b. DiversiFoam Products.
 - c. Dyplast Products.

- B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
- C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 INSULATION ACCESSORIES

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- C. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick, factory primed.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corporation; GlasRoc Sheathing.
 - b. Georgia-Pacific Corporation; Dens Deck.
 - c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - d. Temple-Inland, Inc; GreenGlass Exterior Sheathing.
 - e. USG Corporation; Securock Glass Mat Roof Board.
- D. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

2.7 ASPHALT MATERIALS

- A. Roofing Asphalt: ASTM D 312, Type III or Type IV.
- B. Asphalt Primer: ASTM D 41/D 41M.

2.8 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.1 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.

3.2 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Install tapered insulation under area of roofing to conform to slopes indicated.
- C. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
 - 1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- D. Mechanically Fastened: Install each layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
 - 3. Set each subsequent layer of insulation in insulation adhesive, firmly pressing and maintaining insulation in place.
- E. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
 - 1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
- F. Install slip sheet over cover board and immediately beneath roofing.

3.3 MECHANICALLY FASTENED ROOFING INSTALLATION

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

- B. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Mechanically fasten or adhere roofing securely at terminations, penetrations, and perimeter of roofing.
- D. Apply roofing with side laps shingled with slope of roof deck where possible.
- E. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates or metal battens centered within seam, and mechanically fasten TPO sheet to roof deck.
- F. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- G. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.4 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.5 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.6 PROTECTING AND CLEANING

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

- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes sheet metal flashing and trim in the following categories:

1. Exposed trim, drip edges, and fascia.
2. Metal flashing, counter flashing and diverters.
3. Wall Base Flashing/Termite Shields.
4. Gutters and Downspouts.
5. Elevated deck and balcony flashings.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing. Use clips, continuous cleats or other concealed means to secure exposed flashing.
- B. Design and install flashings to withstand the wind loads imposed by wind speed as indicated on the drawings.

1.3 SUBMITTALS

- A. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.
- B. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 6. Include details of termination points and assemblies.
 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 8. Include details of roof-penetration flashing.
 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
 10. Include details of special conditions.
 11. Include details of connections to adjoining work.
 12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

- D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- E. Samples for Verification: For each type of exposed finish.
 - 1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 - 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
- F. Calculations showing size of gutter and downspouts using the charts and formula contained in the SMACNA Handbook with applicable rainfall rate.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance. Installer shall be an active member of National Roofing Contractor's Association.

1.5 PROJECT CONDITIONS

- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:
 - 1. Factory-Painted Aluminum Sheet: ASTM B 209 (ASTM B 209M), 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
- B. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.

- C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- D. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
- E. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
- F. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.3 FABRICATION, GENERAL

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
- D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Galvanized steel edges to be seamed, form seams, and solder.
- E. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.
- H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
- I. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
 - 1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.4 SHEET METAL FABRICATIONS

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

- B. Door and Window Head Flashing: Fabricate from the following material:
 - 1. Pre-finished Aluminum: .032 inches thick.
- C. Base Flashing and Counter flashing: Fabricate from the following material:
 - 1. Pre-finished Aluminum: .040 inches thick.
- D. Flashing Receivers: Fabricate from the following material:
 - 1. Pre-finished Aluminum: .050 inches thick.
- E. Drip Edges: 2-inches x 2-inches, Fabricate from the following material:
 - 1. Pre-finished Aluminum: .032 inches thick.
- F. Fascia wrap: Fabricate from the following material:
 - 1. Pre-finished Aluminum: .032 inches thick.
- G. Deck Flashings where concealed underway continuous waterproofing: Fabricate from the following materials:
 - 1. Galvanized Steel: .022 inches thick.
- H. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide 4 pound sheet lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 4 inches from pipe onto roof.
- I. Wall Base Flashing/Termite Shields:
 - 1. Galvanized steel: .034 inches thick.
 - a. Set in bed of construction adhesive; similar to sub-floor adhesive.
- J. T Bar flashing and receiving pocket for Concrete Topping Installations:
 - 1. 1-1/2" x 1/1/2" x 1/4" thick
 - 2. 1/8" thick aluminum.
 - 3. Cut slot at ends for flashing to penetrate.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 - 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. Fry Reglet Corporation.
 - b. Heckmann Building Products, Inc.

- c. Hickman Company, W. P.
 - d. Hohmann & Barnard, Inc.
2. Material: Aluminum, 0.024 inch thick.
 3. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 5. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
 6. Finish: With manufacturer's standard color coating.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 1. Gutter Profile: Square sized according to International Plumbing Code, and according to cited sheet metal standard.
 2. Expansion Joints: Lap type.
 3. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
 - a. Aluminum: 0.032 inch thick.
 4. Finish: Powder coated.
- B. Downspouts: Fabricate square downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
 1. Fabricate from the following materials:
 - a. Aluminum: 0.024 inch thick.
 2. Finish: Powder coated.

2.7 FINISHES

- A. Pigmented Coatings (Powder Coat) Organic Coating: As specified below. Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2604 except with a minimum dry film thickness of 1.5 mils medium gloss.
 - a. Color: As selected by Architect from manufacturer's full range.
- B. Shop Finish: Provide manufacturer's standard baked-on, white acrylic shop finish on sheet metal units (gutters, downspouts, and similar exposed units); 1.0-mil dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual," and SMACNA's "Architectural Sheet Metal Manual", whichever has the greatest requirement. Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- D. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
 1. Use joint adhesive for nonmoving joints specified not to be soldered.
- E. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

- F. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer. This would be but not limited to areas in contact with “ACQ” treated wood products. Where sheet metal is in contact with ACQ wood preservative sheet metals shall be galvanized ASTM A 653 G90.
 - 1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
 - 2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.
- G. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches and bed with sealant.
 - 1. Seal top edge of counter flashings with building tape.
- H. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:
 - 1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
 - 2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.
- I. Install gutters and downspouts per Chapter 1 of the “SMACNA” Architectural Sheet Metal Manual – Current Edition.”
 - 1. Terminate downspouts a minimum of 12 inches from face of building.
- J. Deck Flashing:
 - 1. Return all edge flashings to the wall sheathing and seal with tape.
 - 2. Seal all corner joints with mastic and tape.
 - 3. Extend flashings up wall a minimum of 6” above the finish concrete deck topping.
 - 4. Set all flashings in mastic.

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with riveted and sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Fasten gutter spacers to front and back of gutter.
 - 2. Anchor gutter with gutter brackets spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.

3. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
 2. Provide elbows at base of downspout to direct water away from building.
 3. Connect downspouts to underground drainage system.
- D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copings.
2. Roof-edge drainage systems.
3. Reglets and counterflashings.

B. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.2 ACTION SUBMITTALS

A. Product Approval: Submit current Product Approval documentation in accordance with the Florida Building Code.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

D. Samples: For each type of roof specialty and for each color and texture specified.

E. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

F. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
2. Include copings, roof-edge drainage systems, reglets and counterflashings made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of roof specialty.
- C. Product Test Reports: For copings, for tests performed by a qualified testing agency.
- D. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class and SPRI ES-1 tested to specified design pressure.
- B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 075423 "Thermoplastic Polyolefin (TPO) Roofing."
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: As indicated on Drawings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COPINGS

- A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
 - 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. ATAS International, Inc.
 - b. Berridge Manufacturing Company.
 - c. Hickman Company, W. P.
 - d. Perimeter Systems; a division of SAF.

2. Formed Aluminum Sheet Coping Caps: Aluminum sheet, 0.040 inch thick.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Three-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Coping-Cap Attachment Method: As indicated.
 - a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.
 - b. Face-Leg Cleats: Concealed, continuous stainless steel.

2.3 ROOF-EDGE DRAINAGE SYSTEMS

- 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. ATAS International, Inc.
 2. Hickman Company, W. P.
 3. Merchant and Evans.
 4. Perimeter Systems; a division of SAF.
- B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
 1. Aluminum Sheet: 0.040 inch thick.
 2. Gutter Profile: As indicated, according to SMACNA's "Architectural Sheet Metal Manual."
 3. Corners: Factory mitered and mechanically clinched and sealed watertight.
- C. Downspouts: Shaped as indicated complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
 1. Formed Aluminum: 0.040 inch thick.
- D. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Bedding flange shall be factory coated with material compatible with roofing membrane and adhesives.
 1. Formed Aluminum: 0.032 inch thick.
- E. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout, exterior flange trim, and built-in overflow.
 1. Formed Aluminum: 0.032 inch thick.
- F. Aluminum Finish: Three-coat fluoropolymer.
 1. Color: As selected by Architect from manufacturer's full range.

2.4 REGLETS AND COUNTERFLASHINGS

- 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. Fry Reglet Corporation.
 - 2. Heckmann Building Products, Inc.
 - 3. Hickman Company, W. P.
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
 - 1. Formed Aluminum: 0.050 inch thick.
 - 2. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 - 3. Concrete Type, Embedded: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 - 4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
 - 5. Multiuse Type, Embedded: For multiuse embedment in masonry mortar joints.
- C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:
 - 1. Formed Aluminum: 0.032 inch thick.

2.5 MATERIALS

- A. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
- B. Aluminum Extrusions: ASTM B221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

2.6 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 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. Carlisle Coatings & Waterproofing Inc.
 - b. GCP Applied Technologies Inc.
 - c. Owens Corning.

2. Thermal Stability: ASTM D1970/D1970M; stable after testing at 240 deg F.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F.

2.7 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
- B. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- C. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- E. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Coil-Coated Aluminum Sheet Finishes:
 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- D. Aluminum Extrusion Finishes:
 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
 - 1. Apply continuously under copings and reglets and counterflashings.
 - 2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

3.3 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.

3.5 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
1. Provide elbows at base of downspouts at grade to direct water away from building.
 2. Connect downspouts to underground drainage system indicated.
- D. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
 2. Loosely lock front edge of scupper with conductor head.
 3. Seal or solder exterior wall scupper flanges into back of conductor head.

- E. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper discharge.

3.6 REGLET AND COUNTERFLASHING INSTALLATION

- A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.
- C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof Curbs
 - 2. Equipment supports.
 - 3. Roof hatches.

1.2 SUBMITTALS

- A. Product Approval: Submit current Product Approval documentation in accordance with the Florida Building Code.
- B. Product Data: For each type of roof accessory indicated.
- C. Shop Drawings: For roof accessories.
- D. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.
- E. Delegated-Design Submittal: For roof curbs and equipment supports 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. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
 - 2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.3 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

- B. Delegated Design: Engage a qualified professional engineer, to design roof curbs and equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 - 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. Greenheck Fan Corporation.
 - b. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - c. Roof products and system (RPS); a division of Hart Cooley, Inc.
 - d. Thybar Corporation.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: As Indicated on the equipment Schedule.
- D. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch thick.
 - 1. Finish: Two-coat fluoropolymer.
 - 2. Color: Match Architect's sample.
- E. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
 - 3. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
 - 4. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
 - 5. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 - 6. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.
 - 7. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
 - 8. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 - 9. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 EQUIPMENT SUPPORTS

- A. Equipment Supports: Rail-type metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, and integrally formed structure-mounting flange at bottom.
 - 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. LMCurbs.
 - b. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - c. Pate Company (The).
 - d. Roof Curb Systems.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: As Indicated on the equipment Schedule.
- D. Material: steel sheet, Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
 - 1. Finish: Mill phosphatized.
- E. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
 - 1. Fabricate equipment supports to minimum height as acceptable to the roofing membrane manufacturer but high enough to facilitate re-roofing. Minimum per FBC or applicable codes, or as otherwise indicated, whichever is greater.

2.4 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
- B. Basis of Design Product and Manufacturer; Bilco Model F-50TB, 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. Babcock-Davis.
- C. Type and Size: Single-leaf lid.
- D. Size: As indicated, minimum, 30-inches x 30-inches.
- E. Performance characteristics:

1. Cover and curb shall be thermally broken to prevent heat transfer between interior and exterior surfaces.
 2. Cover shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
 3. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 4. Operation of the cover shall not be affected by temperature.
 5. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.
- F. Cover: Shall be 11 gauge aluminum with a 5" beaded flange with formed reinforcing members. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. Cover shall have a heavy extruded EPDM rubber gasket bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
- G. Cover insulation: Shall be 3" thick polyisocyanurate with an R-value = 20.3 ($U=0.279 \text{ W/m}^2\text{K}$), fully covered and protected by an 18 gauge aluminum liner.
- H. Curb: Shall be 12" in height and of 11 gauge aluminum. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. The curb shall be formed with a 5-1/2" flange with 7/16" holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip flashing system, including stamped tabs, 6" on center, to be bent inward to hold single ply roofing membrane securely in place.
- I. Curb insulation: Shall be 3" thick polyisocyanurate with an R-value = 20.3.
- J. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.
- K. Hardware
1. Heavy stainless steel pintle hinges shall be provided
 2. Cover shall be equipped with a spring latch with interior and exterior turn handles
 3. Roof hatch shall be equipped with interior and exterior padlock hasps.
 4. The latch strike shall be a stamped component bolted to the curb assembly.
 5. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" diameter red vinyl grip handle to permit easy release for closing.
 6. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed. [For installation in highly corrosive environments or when prolonged exposure to hot water or steam is anticipated, specify Type 316 stainless steel hardware].
 7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.
- L. Finishes: Factory finish shall be mill finish aluminum.
- M. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Height: As Indicated.

2. Posts and Rails: As Indicated.
3. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
4. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
5. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
7. Fabricate joints exposed to weather to be watertight.
8. Fasteners: Manufacturer's standard, finished to match railing system.
9. Finish: Manufacturer's standard.

2.5 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F, thickness as indicated.
- C. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. Underlayment:
 1. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBSmodified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- H. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- I. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Verify dimensions of roof openings for roof accessories. Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- E. Roof-Hatch Installation:
 - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 2. Attach safety railing system to roof-hatch curb.
 - 3. Attach ladder-assist post according to manufacturer's written instructions.
- F. Seal joints with sealant as required by roof accessory manufacturer.
- G. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.
- H. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078124 - INTUMESCENT FIRE-RESISTIVE PAINT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes intumescent fire-resistive coatings.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with indicated fire-resistance design.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Albi Manufacturing, Division of StanChem Inc.; Albi Cote FRL.
 - b. Flame Controls Coatings LLC; Flame Control No. 20-20A.
 - c. Guardian Fire Testing Laboratories, Inc; ForceField; FIREGUARD E-84
 - 2. Application: Designated for "interior general purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
 - 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
 - 4. Surface-Burning Characteristics: Flame-spread and smoke-developed indexes of 25 and 50, respectively, or less according to ASTM E 84.
 - 5. Finish: Smooth.
 - a. Color and Gloss: Clear semi-gloss.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

3.2 APPLICATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify that objects penetrating fireproofing are securely attached to substrates and that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

3.3 CLEANING AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Repair fireproofing damaged by other work before concealing it with other construction.
- C. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078124

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
 - 1. Walls and partitions.
 - 2. Floors, ceilings, and roofs.
 - 3. Smoke barriers.

1.2 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
 - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
- B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. Product Data: For each type of through-penetration firestop system product indicated.

- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 - 2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and Owners, and other information specified.
- D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.
- E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems 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.
- B. Installer Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in "Fire Resistance Directory."

- E. Preinstallation Conference: Conduct conference at Project site./

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Hilti Construction Chemicals, Inc.
 2. Nelson Firestop Products.
 3. 3M Fire Protection Products.
 4. Tremco

2.2 FIRESTOPPING, GENERAL

- A. **Compatibility:** Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. **Accessories:** Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.
- C. **Exposed Penetration Firestopping Systems:** Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

2.3 FILL MATERIALS

- A. **General:** Provide through-penetration firestop systems containing the types of fill materials indicated by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
- B. **Latex Sealants:** Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- C. **Firestop Devices:** Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. **Intumescent Composite Sheets:** Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- E. **Intumescent Putties:** Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. **Intumescent Wrap Strips:** Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. **Mortars:** Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

- H. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.

- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Inspection of firestop systems shall be conducted in accordance with ASTM E 2174 and as follows:
 - a. Method of Post-Installation Inspection: Destructive type verification in accordance with ASTM E 2174 paragraph 10.12.2.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

1. Any type of firestop system noted in ASTM E 2174, paragraph 10.12.2 that does not comply with the inspection documents will require repair or replacement and re-inspection of that firestop system plus one full additional inspection, of the number specified in ASTM E 2174, paragraph 10.12.2, of that type firestop system. If non-compliance occurs on 10% or more of the quantity of firestop products or firestop systems within ASTM E 2174, paragraph 10.12.1 or 10.12.2, then inspection of those particular types of firestop systems shall cease. The installer shall inspect their own work, repair, or replace those like firestops within the area prior to recommencement of inspections by the inspector.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.
 - D. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
 - E. The cost for repair, replacement of tested locations, re-inspection (if required), and retesting (if required), shall be paid by the contractor and or sub-contractor. The Owner will not be responsible for any additional costs.

3.5 IDENTIFICATION

- A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fire-resistive joint systems for the following:
 - 1. Floor-to-floor joints.
 - 2. Floor-to-wall joints.
 - 3. Head-of-wall joints.
 - 4. Wall-to-wall joints.
 - 5. Joints between perimeter edge of fire-resistance-rated floor assemblies and back of non-fire-resistance-rated, exterior, glazed aluminum curtain walls.

1.2 PERFORMANCE REQUIREMENTS

- A. General: For joints in the following constructions, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed:
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
 - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
 - 3. Fire-resistance-rated floor assemblies.
 - 4. Exterior curtain-wall assemblies and fire-resistance-rated floor assemblies.
- B. Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.
 - 1. Load-bearing capabilities as determined by evaluation during the time test.
- C. Fire Resistance of Perimeter Fire-Containment Systems: Integrity and insulation ratings indicated as determined by UBC Standard 26-9 and UL 2079.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

- C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.
- D. Qualification Data: For Installer.
- E. Compatibility and Adhesion Test Reports: From fire-resistive joint system manufacturer indicating the following:
 - 1. Materials forming joint substrates have been tested for compatibility and adhesion with fill materials.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICBO ES AC30, from the ICBO Evaluation Service.
- G. Research/Evaluation Reports: For each type of fire-resistive joint system.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire-resistive joint systems for each kind of joint and construction condition indicated through one source from a single manufacturer.
- B. Preconstruction Compatibility and Adhesion Testing: Submit to fire-resistive joint system manufacturers, for testing indicated below, samples of materials that will contact or affect fill materials.
 - 1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of fill materials to joint substrates.
 - a. Perform tests under environmental conditions replicating those that will exist during installation.
 - 2. Submit no fewer than nine pieces of each type of material, including joint substrates, forming materials, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain fire-resistive joint system manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
- C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in "Performance Requirements" Article:
 - 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per ICBO ES AC30 and are qualified for types of joints and joint movement capabilities indicated in a current Evaluation Report by the ICBO Evaluation Service.
 - 3. Fire-resistive joint systems are identical to those tested per UL 2079. Provide rated systems complying with the following requirements:

- a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
- b. Fire-resistive joint systems correspond to those indicated by referencing system designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

- a. Fire-Resistive Joint Systems:
 - 1) A/D Fire Protection Systems Inc.
 - 2) Hilti, Inc.
 - 3) ISOLATEK International.
 - 4) Nelson Firestop Products.
 - 5) 3M Fire Protection Products.
 - 6) Tremco, Inc.
 - 7) United States Gypsum Company.
- b. Perimeter Fire-Containment Systems:
 - 1) United States Gypsum Company.

2.2 FIRE-RESISTIVE JOINT SYSTEMS, GENERAL

- A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- B. Accessories: Provide components of fire-resistive joint systems, including forming materials that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.3 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where UL-classified fire-resistive joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.

2.4 PERIMETER FIRE-CONTAINMENT SYSTEMS

- A. Where UL-classified perimeter fire-containment systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHDG.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
1. Inspection of fire-resistive joint systems shall be conducted in accordance with ASTM E 2393 and as follows:
 - a. Method of Post-Installation Inspection: ASTM E 2393 paragraph 10.12.2.1 (1) Destructive type verification of the fire resistive joint system and repair of the joint system.
 - 1) The inspector shall conduct a destructive type of post-installation inspection in accordance with ASTM E 2393 paragraph 10.12.2.1 (1), except for mechanical systems, which shall be inspected in accordance with ASTM E 2393 paragraph 10.12.1. as follows:

- a) The inspector shall be on site during installation and randomly witness a minimum of 5% of total linear feet of each type of fire resistive joint system being installed.
- B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.
 - 1. Any type of fire-resistant joint system noted in ASTM E 2393, paragraph 10.12 that does not comply with the inspection documents will require repair or replacement and re-inspection of that fire resistive joint system plus one full additional inspection, of the percentage specified in ASTM E 2393, paragraph 10.12.1 or of the number specified in ASTM E 2393 paragraph 10.12.2, as applicable, of that type fire resistive joint system. If non-compliance occurs on 10% or more of the quantity of like fire resistive joint systems within ASTM E 2393, paragraph 10.12.1 or 10.12.2, then inspection of those particular type of fire resistive joint systems shall cease. The installer shall inspect their own work, repair, or replace those like fire resistive joint systems within the area prior to re-commencement of inspections by the inspector.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.
- D. The cost for repair, replacement of tested locations, re-inspection (if required), and retesting (if required), shall be paid by the contractor and or sub-contractor. The Owner will not be responsible for any additional costs.

3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes joint sealants.

1.2 SUBMITTALS

- A. Product Data: For each joint-sealant and use for products indicated.
- B. 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.
- C. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.
- C. 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.

1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with cast stone masonry substrates.
 - 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.

5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.5 FIELD CONDITIONS

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

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

1.6 WARRANTY

A. Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric 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.

- B. Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those 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.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Sealants: Provide the following products for each application listed. Substitutions for exterior building joint sealants shall be listed on the Validated Products list published by the Sealant, Waterproofing, and Restoration Institute (SWRI).

1. Joint-Sealant: One-part neutral cure silicone sealant; elongation of 800%, joint movement capability of plus-or-minus 25% and Shore A durometer hardness of 45.
 - a. Applications: Interior air sealing between a sheet or liquid applied weather resistant barrier and fenestration element; edge lap seal for weather resistant barriers; sealing penetrations in weather resistant barriers.
 - b. Joint Location: Surfaces common in sheet or peel and stick weather resistant barriers.
 - 1) Product and Manufacturer: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a) Dow Corning 758 Silicone Weather Barrier Sealant; Dow Corning Corp.
2. Joint Sealant - One-Part: For precast concrete, poured-in-place concrete, and concrete-to-concrete and concrete-to-masonry; one-part silicone sealant, having a joint movement capability of plus-or-minus 100% elongation, minus 50% compression, and Shore A durometer hardness of 15.
 - a. Product and Manufacturer:
 - 1) Dow Corning 790 Silicone Building Sealant; Dow Corning Corp.
 - b. Warranty: Manufacturer's standard 20-year warranty.
3. Joint Sealant - One-Part: For masonry-to-aluminum, steel-to-aluminum, concrete-to-aluminum, steel-to-steel, and other metal-to-metal joints (including KYNAR coatings); one-part silicone sealant having a joint movement capability of plus-or-minus 50% elongation, and Shore A durometer hardness of 30.
 - a. Product and Manufacturer:
 - 1) Dow Corning 795 Silicone Building Sealant; Dow Corning Corp.
 - b. Warranty: Manufacturer's extended 20-year warranty.

- B. Joint Sealant - Two-Part, Pourable Urethane Sealant: For horizontal joints, exterior where sealant will be covered with paint after application and interior; provide joint sealant with a joint movement capability of plus-or-minus 25%.
- a. Products and Manufacturers: Provide one of the following.
 - 1) Vulkem 245; Tremco, Inc.
 - 2) NR200 Urexpan; Pecora Corp.
 - 3) Sikaflex 2c SL; Sika Corp.
 - 4) THC-900; Tremco, Inc.
 - b. Warranty: Manufacturer's extended 5-year warranty.
2. Joint Sealant - Two-Part Urethane Non-Sag Sealant: For general interior use; provide joint sealant with a joint movement capability of plus-or-minus 50%.
- a. Products and Manufacturers: Provide one of the following.
 - 1) Vulkem 922; Tremco, Inc.
 - 2) Dynatrol II; Pecora Corp.
 - 3) Sikaflex 2c NS; Sika Corp.
 - 4) NP II; Sonneborne Building Products Division, ChemRex, Inc.
 3. Warranty: Manufacturer's extended 5-year warranty.
 4. Joint Sealant - One-Part Silicone - Sanitary Sealant: For Interior use at plumbing fixtures in toilets and janitor closets, and horizontal and vertical joints of dissimilar materials in toilets and other wet areas.
 - a. Products and Manufacturers: Provide one of the following.
 - 1) Dow Corning 786 Silicone Mildew Resistant Sealant; Dow Corning Corp.
 - 2) SCS1700 Sanitary; General Electric Co.
 - 3) Pecora 898 Silicone Mildew Resistant Silicone Sealant; Pecora Corp.
 - 4) Tremsil 200; Tremco, Inc.
 - b. Warranty: Manufacturer's extended 3-year warranty.
 5. Joint Sealant - One-Part Latex Sealant: For interior use for horizontal and vertical joints around door frames, and joints between dissimilar materials.
 - a. Products and Manufacturers: Provide one of the following.
 - 1) AC-20 + Silicone; Pecora Corp.
 - 2) Sonolac; Sonneborn Building Products Div., ChemRex, Inc.
 - 3) Tremflex 834; Tremco, Inc.
 - b. Warranty: Manufacturer's standard warranty.
 6. Joint Sealant - Exterior Joints Below Grade: Polyurethane (contrasting color).
 - a. Product and Manufacturer: Provide the following.
 - 1) Cecoflex 1-A

7. Joint Sealant - Acoustic 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.

- a. Product and Manufacturer: Provide the following.

- 1) Pecora Corporation; AC-20 FTR.
 - 2) USG Corporation; SHEETROCK Acoustical Sealant.

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

2.2 JOINT-SEALANT BACKING

- A. Backer Rod (Joint Fillers, Compressible Filler): Type B, ASTM C 1330, preformed, cylindrical, flexible, compressible, resilient, non-staining, bi-cellular material, with a density of 24-48 km/m³ per ASTM D1622, tensile strength greater than 200 kPa per ASTM D 1623, and water absorption less than 0.1 g/cc per ASTM C 1016.

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

- a. Sof Rod; Nomaco, Inc., Zebulon, NC.

2.3 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.

PART 3 - EXECUTION

3.1 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Backing Materials: Install sealant backings of type 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.
- C. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

END OF SECTION 079200

SECTION 079513 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Expansion control systems.

1.2 SUBMITTALS

- A. Product Data: Include the following information in tabular form:
 - 1. Manufacturer and model number for each expansion control system.
 - 2. Expansion control system location cross-referenced to Drawings.
 - 3. Nominal joint width.
 - 4. Movement capability.
 - 5. Materials, colors, and finishes.
- B. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches long in size.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Provide factory-fabricated expansion joint cover assembly systems capable of withstanding the types of loads and of accommodating the kinds of movement, and the other functions for which they are designed including those specified below, without failure. Types of failure include those listed in Appendix X3 of ASTM E 1399.
 - 1. Exterior Joints: Maintain continuity of weather enclosure.
 - 2. Joints in Fire-Resistance-Rated Assemblies: Maintain fire-resistance ratings of assemblies.
 - 3. Joints in Smoke Barriers: Maintain integrity of smoke barrier.
 - 4. Other Joints: Where indicated, provide joint systems that prevent penetration of water, moisture, and other substances deleterious to building components or content.
 - 5. Joints in Surfaces with Architectural Finishes: Serve as finished architectural joint closures.

2.2 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
 - 2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.
- B. Coordination: Coordinate installation of exterior wall and soffit expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified in Division 07 Sections.

2.3 EXPANSION CONTROL SYSTEMS

- A. Basis of Design: Balco, Inc. Subject to compliance with requirements, provide the products specified as follows:
 - 1. Exterior Expansion Joints:
 - a. Wall to Wall: Emseal, model EFR3
 - 1) Size: As indicated.
 - 2) Color: As selected by Architect from Manufacturers full range.
- B. Products of the following manufacturers are also acceptable providing compliance with all specified requirements.
 - 1. Architectural Art Manufacturing, Inc.
 - 2. Balco C/S Group.
 - 3. Watson Bowman Acme Corp., dugussa.
 - 4. InPro Corporation.

2.4 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Extruded Preformed Seals: Single or multicellular elastomeric profiles as classified under ASTM D 2000, designed with or without continuous, longitudinal, internal baffles. Formed to fit compatible frames, in color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.
- C. Preformed Sealant: Manufacturer's standard elastomeric sealant complying with ASTM C 920, use T, factory-formed and -bonded to metal frames or anchor members; in color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.

1. Joints 2 Inches Wide and Less: Withstand plus or minus 35 percent movement of the joint width without failure.
- D. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion control system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.

2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
5. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 079513

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel doors.
 - 2. Steel door frames.
 - 3. Fire-rated door and frame assemblies.

1.2 DEFINITIONS

- A. Steel Sheet Thickness: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.3 SUBMITTALS

- A. Product Approval: Submit current Product Approval in accordance with the Florida Building Code.
- B. Engineering Responsibility: Prepare engineering data for exterior steel doors and frames including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project signed and sealed by the qualified professional engineer.
- C. Testing and Labeling: Comply with the Code. Submit manufacturer's certification indicating compliance.
- D. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
- E. Certification: Provide written certification indicating Code compliance for all exterior doors and frames.
- F. Shop Drawings: SDI-106 Recommended Standard Door Type Nomenclature and SD-111 Recommended Standard Details for Steel Doors & Frames shall be used as a guide in the development of Schedules and Shop Drawings.
 - 1. Show the following:
 - a. Elevations of each door design.
 - b. Indicate location, size, door and frame types, rating and hand of each door.
 - c. Indicate door construction, details and methods of assembling sections, hardware locations, anchorage & fastening methods and finish requirements.
 - d. Include anchoring details engineered to meet wind load requirements to comply with the Code.

- e. Utilize same designation as Architect's door mark.
- G. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
- H. Samples:
 - 1. Submit sample of typical mitered, welded doorframe corner for quality verification.
 - 2. Samples shall be specifically required for non-specified manufacturer's products submitted as a Substitution.
- I. Product Certificates: Product certificates shall be required by manufacturers of non-named products certifying that each product furnished meets the Specifications and with individual project requirements for the purpose intended. Certificates shall be submitted with Shop Drawings.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Employ only experienced Contractors (Installers) skilled in the successful installation of the specified materials and assemblies on similar projects for a minimum of five years.
- B. Supplier Qualifications: Supplier shall be regularly engaged in contract work and be staffed to expedite the work. The firm shall have been furnishing material for projects of similar scope, in the vicinity, for not less than 5 years. At the Owner's request the supplier shall send qualified representatives to the job site when needed during the course of installation. The supplier shall be or shall employ a Certified Door Consultant (CDC), certified by DHI, who shall be available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
- C. Source Limitations: Obtain steel doors and frames through one source from a single manufacturer.
- D. Steel Door and Frame Standard: Comply with requirements contained in SDI 100 Recommended Specifications for Standard Steel Doors and Frames unless more stringent requirements are indicated.
- E. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- F. Preparation/Field Verification
 - 1. Verify door frames are in proper location and have been properly anchored in accordance with Specifications and SDI 105 Recommended Erection Instruction for Steel Frames.
 - 2. Verify that frames comply with indicated requirements for type, size, location and swing characteristics. Verify that frames have been installed with plumb jambs and level heads.
 - 3. Verify that Shop Drawings have been successfully submitted, reviewed and returned.
- G. Frame Tolerances: Utilize UNF Frame Tolerance Check List Report for each opening to verify proper installation.
 - 1. Initiate reports after installation of frame and prior to installation of adjacent walls or construction. Re-verify report during and after completion of adjacent construction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage.
- B. Doors shall be individually wrapped, protected and packaged as standard of manufacturer.
- C. Each door shall be marked on top and bottom rail with same opening number used on Shop Drawings.
- D. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- E. Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Provide exterior steel doors and frames capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified.
- B. Codes Compliance: Comply with requirements of the Code for wind resistance.
- C. Wind Loads: As indicated on Drawings.
- D. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

- E. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone: As Indicated.

- 1. Large-Missile Test: For openings located within 30 feet of grade.
- 2. Small-Missile Test: For openings located more than 30 feet above grade.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide CECO, ASSA ABLOY or a comparable product by one of the following:

- 1. Curries Company; ASSA ABLOY.
- 2. Republic Doors and Frames.
- 3. Steelcraft; an Allegion brand.

2.3 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366, Commercial Steel (CS), or ASTM A 620, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Metallic-Coated Steel Sheets: ASTM A 653, Commercial Steel (CS), Type B, with an A40 zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

2.4 STANDARD STEEL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

- 1. Design: As indicated.
- 2. Thickness: As indicated.
- 3. Core Construction: Manufacturer's standard foamed-in-place polyurethane core that produces doors complying with ANSI A250.8.

- a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
- b. Insulated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

- 1) Locations: Non-fire rated doors, exterior and interior.

- 4. Vertical Edges for Single-Acting Doors: Beveled edge.

- a. Beveled Edge: 1/8 inch in 2 inches.

- 5. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
- 6. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick end closures or channels of same material as face sheets.

7. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

2.5 EXTERIOR DOORS

- A. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 1. Minimum SDI Level and Physical Performance: Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush).
 2. Face sheets shall be not less than 14 gauge (0.067 in) hot-dipped galvanized G60 steel sheets conforming to ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum A40 (ZF120) coating designation.
 3. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

2.6 INTERIOR DOORS

- A. General: Provide doors of sizes, thickness, and designs indicated.
- B. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 1. Minimum SDI Level and Physical Performance: Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).
 2. Face sheets shall be not less than 16 gauge (0.053 in) hot-dipped galvanized G60 steel sheets conforming to ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum A40 (ZF120) coating designation.

2.7 FRAMES

- A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
- B. Frames: Fabricated from Galvanized G-60 steel sheet.
 1. Fabricate frames with mitered or coped and full back welded corners.
 2. Frames: 14 ga., (0.067 in) hot-dipped galvanized steel sheet.

2.8 ACCESSORIES

- A. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
- B. Supports and Anchors: Fabricated from not less than 0.042-inch- thick, electrolytic zinc-coated or metallic-coated steel sheet.

1. Wall Anchors in Masonry Construction: 0.177-inch- diameter, steel wire complying with ASTM A 510 may be used in place of steel sheet.
- C. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.
- D. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- E. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.
- F. Bituminous Coating: Cold-applied asphalt mastic, two coats minimum 30-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities for frames in contact with CMU or concrete.

2.9 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.
 1. Face sheets shall be minimum 16 gauge (0.053 in) hot-dipped galvanized steel sheets conforming to ASTM A591, Commercial Steel (CS) Class B coating, mill phosphatized.
- C. Interior Door Faces: Fabricate exposed faces of doors, including stiles and rails of nonflush units, from the following material:
 1. Face sheets shall be minimum 18 gauge (0.042 in) cold-rolled steel sheets conforming to ASTM A366/A 366M, Commercial Steel (CS) or ASTM A620/A 620M, Drawing Steel (DS), Type B.
- D. Core Construction: Manufacturer's factory installed core materials that produce a door complying with SDI standards:
 1. Exterior Doors: Insulated; polyurethane or polystyrene core.
 2. Interior Non-Fire Rated Doors: Insulated; polyurethane or polystyrene core.
 3. Interior Fire Rated Doors: Manufacturer's standard core for fire ratings indicated.
- E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.
- F. Clearances for Fire-Rated Doors: As required by NFPA 80.
- G. Single Acting, Door-Edge Profile: Beveled edge.
- H. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

- I. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- J. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- K. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
- L. Frame Construction: Fabricate frames to shape shown.
 - 1. Frames shall be welded construction type and have mitered or butted corners with welded and finished frame faces (seamless). The remaining elements of the frame profile, i.e., rabbet and stop, shall not be continuously welded.
 - 2. Frames for exterior use shall have shall have mitered corners welded continuously and finished frame faces (seamless).
 - 3. Frames shall be provided with temporary spreader bars for shipping and handling purposes.
 - 4. Frames for exterior use shall be hot-dipped galvanized steel after fabrication.
 - 5. Frames for paired doors shall be furnished with a removable center mullion, where indicated.
 - 6. Mullions and transom bars shall be joined to adjacent members by welding so as to maintain alignment of parts and assure performance of completed frames. Face joints shall be welded and ground smooth (seamless).
 - 7. Exterior frames shall be anchored in accordance with the Manufacturers recommendations.
 - 8. Interior frames shall be provided with a minimum of three anchors per jamb suitable for the adjoining wall construction. Anchors shall be minimum 18-gauge steel or minimum 7-gauge wire. Frames over 7'-6" shall be provided with additional wall anchors as required.
 - 9. In addition, frames shall be provided with minimum 18-gauge base anchor. For existing masonry wall conditions that will not accept base anchor, an additional jamb anchor shall be provided.
 - 10. Frames shall be furnished in manufacturer's standard factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.
- M. Hardware Preparation
 - 1. Provide minimum hardware reinforcing gauges as required in ANSI A250.6.
 - 2. Doors and frames shall be reinforced, drilled and tapped to receive mortised hinges, locks, latches, flush bolts, etc, as required in ANSI A115 and ANSI A250.6.
 - 3. Doors shall be reinforced for specified surface-mounted hardware. Drilling and tapping may be completed at the job site by the installers.
 - 4. Hardware shall be located in accordance with locations prescribed in ANSI A250.8/SDI 100.
- N. Fire-Rated Doors, Frames, Hardware and Components:
 - 1. Both fire-rated doors and frames shall bear labels of a recognized test lab or certifying agency acceptable to the authority having jurisdiction. Door labels shall indicate the hourly rating; frame labels do not indicate the hourly rating since they assume the rating of the fire door.

2.10 FINISHES

- A. Factory Finish: Factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.
 - 1. Coat all surfaces including tops and bottoms of doors.
- B. Field Finishing:
 - 1. Doors and Frames: Refer to Section 099100, "Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with insulation.
5. Concrete Walls: Solidly fill space between frames and concrete with insulation.
6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb 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.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.4 PROTECTION DURING CONSTRUCTION

- A. Steel doors shall be protected at all times during construction. After installation, take appropriate measures to protect doors from abuse.
- B. Replace doors and frames that are damaged or do not comply with requirements. Doors and frames may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

3.5 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. 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.
- C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081434 – INTERIOR DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Masonite clad stile and rail wood doors.
 - 2. Wood louvered doors

1.2 SUBMITTALS

- A. Product Data: For each type of door.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, including panels, and moldings (sticking).
 - 1. Indicate locations and holes for hardware.
 - 2. Indicate any interior doors requiring fire ratings.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.

1.4 WARRANTY

- A. Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, and have warped (bow, cup, or twist).
 - 1. Manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 MASONITE CLAD STILE AND RAIL DOORS

- A. Manufacturer – Basis of Design: Masonite International Corporation
 - 1. Interior Doors:
 - a. Panel Configuration: As indicated.
 - b. Panel Profile: As selected by the Architect from manufacturer's standard profiles.
 - c. Core: Hollow unless otherwise indicated.
 - d. Finish: Factory prime painted.
 - e. Fire Rating: As indicated.

2.2 WOOD LOUVERED DOORS

A. Manufacturer – Basis of Design: Masonite International Corporation

1. Masonite wood door series (louvered)
 - a. Door Faces: Louver over louver.
 - b. Finish: Clear pine door.

2.3 FABRICATION

- A. Fabricate stile and rail wood doors in sizes indicated for Project-site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/2 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 3/8 inch from bottom of door to top of threshold.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W Series standards, and hardware templates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and substrates, with Installer present, for suitable conditions where doors will be installed.
 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 08710 Section "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and with referenced quality standard, and as indicated.

3.3 ADJUSTING

- A. Operation: Re-hang or replace doors that do not swing or operate freely.

END OF SECTION 081434

SECTION 081435 - STEEL-CLAD WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior Steel-Clad wood swing doors

1.2 CODE COMPLIANCE

- A. Exterior openings shall meet the requirements of the Florida Building Code.
 - 1. Provide product evaluations and installation requirements indicating compliance with Code requirements.

1.3 SUBMITTALS

- A. Product Approval: Submit current Product Approval documentation in accordance with the Florida Building Code.
- B. Product Data: Submit door manufacturer current product literature, including installation instruction.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and other pertinent data.
- D. Samples: Provide finish samples for all products.
- E. Design Data: Provide manufacturer test report numbers indicating product compliance with indicated requirements.

1.4 REFERENCES

- A. American Architectural Manufacturer Association (AAMA)
 - 1. AAMA 1304; Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors, materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store doors as recommended by manufacturer.

1.6 WARRANTY

- A. Manufacturer standard warranty indicating that doors will be free from material and workmanship defects from the date of substantial completion for the time periods indicated below:

- 1. Door System: 10 Years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide doors capable of withstanding the effects of the following loads based on testing units representative of those indicated for the Project that pass AAMA/NWWDA 101/I.S.2, Section 2.1.4.2, "Uniform Structural Load Test":
 - 1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2- Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 - a. Basic Wind Speed: As indicated
 - b. Importance Factor: As indicated
 - c. Exposure Category: As indicated
- B. Uniform Load Deflection Test: Provide doors with framing, including mullions that limit lateral deflection of glass edges to L/175 of glass-edge length or 3/4 inch whichever is less, at uniform design pressures when tested according to AAMA/NWWDA 101/I.S.2, Section 2.1.4.1, "Uniform Load Deflection Test"
- C. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- D. Underwriters Laboratories, Inc. (UL)
 - 1. UL 10B: Standard for Fire Test of Door Assemblies.
 - 2. UL 10C: Standard for positive Pressure Fire Tests of Doors Assemblies.
- E. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/NWWDA 101/I.S.2, Water Resistance Test.
 - 1. Test Pressure: 20 percent of positive design pressure, not more than 12 lbf/ sq. ft. and not less than 2.86 lbf/sq. ft.
- F. Operating Force: Maximum force 30 lbf to open and 20 lbf. to keep in motion.

G. Forced-Entry Resistance: Comply with Performance Grade 30 requirements when tested according to ASTM F 842.

1. U-Factors: according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.

a. Match Glazing see section 088000 "Glazing."

H. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests according to ASTM E 1996 for Wind Zone as indicated.

1. Large-Missile Test: For openings located within 30 feet of grade.

2. Small-Missile Test: For openings located more than 30 feet above grade.

2.2 MATERIALS, GENERAL

A. Steel-Clad wood door with an insulated core

1. Basis of Design Product and Manufacturer; Jeld-Wen, Energy Saver Contour; 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. Masonite International Corp.

b. Stanley Doors

2.3 EXTERIOR STEEL-CLAD WOOD DOORS

A. Door Design

1. Steel facing: 24 ga. Steel

2. Insulation: Polystyrene.

3. Door Edge: Wood.

4. Door Style: As indicated.

5. Thickness: 1-3/4 inch.

6. Fire rating: As indicated.

2.4 FRAMES AND JAMBS

A. Wood Frames: Western Pine, preservative treated in accordance with WDMA I.S.4.

B. Jambs: Solid pine wood.

1. Profile: Rabbeted.

2. Width: 4-9/16 inch.

3. Casing: Brickmould

2.5 GLAZING

A. Refer to Section 088000 "Glazing."

2.6 FINISH

- A. Two-coats, low-sheen, baked-on enamel primer.

2.7 HARDWARE

- A. Hinges: Solid brass concealed-bearing.
 - 1. Finish: Satin Nickel.
- B. Sills: Aluminum with Polished Aluminum Finish.
- C. Provide doors and frames, with manufacturer's standard weather stripping.

2.8 ACCESSORIES

- A. Flashing
 - 1. Refer to Section 076200 "Sheet Metal Flashing and Trim".
- B. Sealants
 - 1. Refer to Section 079200 "Joint Sealants".
 - 2. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat.

PART 3 - EXECUTION

3.1 GENERAL

- A. Prep doors for owner supplied hinge and lockset.
- B. Install doors in accordance with manufacturer's installation guidelines and recommendations.
- C. Hardware: For installation, see Section 087100 "Door Hardware."

3.2 INSTALLATION

- A. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- B. Install fire-rated doors according to NFPA 80
- C. Install jamb assembly.
 - 1. Seal sill along outside edge and ½ inch in from edge of subfloor.
 - 2. Set door unit into center of opening and tack in place.
 - 3. Shim hinge then latch side jambs straight. Inspect jamb for square, level and plumb.
 - 4. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb 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.
- D. Seal outside perimeter of door unit between brickmold and wall face, along front side of threshold, and between jamb sides and threshold.

3.3 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. 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.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

3.4 PROTECTION

- A. Protect installed doors from damage.

END OF SECTION 081435

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes access doors and frames for walls and ceilings.

1.2 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each door face material in specified finish.
- D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 tested according to the following test method:
 - 1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
 - 2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- 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. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
 - 2. Karp Associates, Inc.
 - 3. Larsen's Manufacturing Company.
 - 4. MIFAB, Inc.
 - 5. Milcor Inc.
 - 6. Nystrom, Inc.
- B. Flush Access Doors with Exposed Flanges:
 - 1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
 - 2. Locations: Wall and ceiling.
 - 3. Door Size: As Indicated.
 - 4. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage.

- a. Finish: Factory prime.
- 5. Frame Material: Same material, thickness, and finish as door.
- 6. Hinges: Manufacturer's standard.
- 7. Hardware: Lock.
- C. Fire-Rated, Flush Access Doors with Exposed Flanges:
 - 1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
 - 2. Locations: Wall and ceiling.
 - 3. Door Size: As Indicated.
 - 4. Fire-Resistance Rating: Not less than that indicated.
 - 5. Temperature-Rise Rating: 450 deg F at the end of 30 minutes.
 - 6. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage.
 - a. Finish: Factory prime.
 - 7. Frame Material: Same material, thickness, and finish as door.
 - 8. Hinges: Manufacturer's standard.
 - 9. Hardware: Lock.
- D. Hardware:
 - 1. Lock: Cylinder.

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Frame Anchors: Same type as door face.
- C. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key all locks alike.

2.5 FINISHES

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

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulated service doors.

1.2 ACTION SUBMITTALS

A. Product Approval: Submit current Product Approval in accordance with the Florida Building Code.

B. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

D. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

E. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.
2. Bottom bar with sensor edge.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.3 CLOSEOUT SUBMITTALS

- A. Special warranty.
- B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Manufacturers Standard.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
 - 1. Design Wind Load: As indicated on Drawings.
 - 2. Testing: According to ASTM E330/E330M.
 - 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
 - 4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.
- B. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone: As Indicated.
 - 1. Large-Missile Test: For openings located within 30 feet of grade.
 - 2. Small-Missile Test: For openings located more than 30 feet above grade.

2.3 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Clopay Building Products.
 - b. Cookson Company.
 - c. McKeon Rolling Steel Door Company, Inc.
 - d. Overhead Door Corporation.
- B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
- C. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E283.
- D. Curtain R-Value: 4.5 deg F x h x sq. ft./Btu.
- E. Door Curtain Material: Aluminum.
- F. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
 - 1. Insulated-Slat Interior Facing: Metal.
 - 2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8-inch-thick; fabricated from aluminum extrusions and finished to match door.
- H. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.
- I. Hood: Match curtain material and finish.
 - 1. Shape: Square.
 - 2. Mounting: Face of wall.
- J. Locking Devices: Equip door with locking device assembly.
 - 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside and outside with cylinders.
- K. Electric Door Operator:
 - 1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.
 - 2. Operator Location: Wall.
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
 - 4. Motor Exposure: Exterior, wet, and humid.

5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.
 - a. Sensor Edge Bulb Color: Black.
7. Control Station(s): Where indicated on Drawings.

L. Curtain Accessories: Equip door with weatherseals.

M. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color matching Architect's sample.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Aluminum Door Curtain Slats: ASTM B209 sheet or ASTM B221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch; and as required.
 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum aluminum thickness of 0.032 inch.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.
- C. Pass Door(s): Swinging-door and frame assembly constructed integrally with the coiling-door

2.6 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Aluminum: 0.040-inch-thick aluminum sheet complying with ASTM B209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

2.7 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 1. Lock Cylinders: As standard with manufacturer and keyed to building keying system.
 2. Keys: Three for each cylinder.
- B. Chain Lock Keeper: Suitable for padlock.
- C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
 1. At door head, use 1/8-inch-thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
 2. At door jambs, use replaceable, adjustable, continuous, nylon brushes.

2.9 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 1. Comply with NFPA 70.
 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
 - 1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
 - 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 - 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
 - 1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
 - 1. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.
- D. Power-Operated Doors: Install according to UL 325.

3.3 FIELD QUALITY CONTROL

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
 - 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing.
2. Exterior and interior manual-swing entrance doors.

1.2 CODE COMPLIANCE

A. Exterior glazing systems shall meet the requirements of the Florida Building Code.

1. Provide product evaluations and installation requirements indicating compliance with Code requirements.

1.3 SUBMITTALS

A. Product Approval: Submit current Product Approval documentation in accordance with the Florida Building Code.

B. Product Data: For each type of product.

1. Include construction details, manufacturers installation instructions, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples: For units with factory-applied color finishes.

- E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- F. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum storefronts and entrances that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum storefronts and entrances manufacturer for installation of units required for this Project.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

- d. Adhesive or cohesive sealant failures.
- e. Water leakage through fixed glazing and framing areas.
- f. Failure of operating components.

- 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed entrances and 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. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
- D. Structural: Test according to ASTM E330/E330M as follows:
 - 1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and 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.
- E. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
- F. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
 2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- G. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor): Match Glazing see Section 088000 "Glazing.
 2. Solar Heat-Gain Coefficient (SHGC): Match Glazing see Section 088000 "Glazing.
- H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- I. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests according to ASTM E 1996 for Wind Zone as indicated.
1. Large-Missile Test: For openings located within 30 feet of grade.
 2. Small-Missile Test: For openings located more than 30 feet above grade.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. EFCO Corporation.
 2. Kawneer North America; an Alcoa company.
 3. Tubelite.
 4. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
 5. YKK AP America Inc.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Front.
 4. Finish: Match Architects sample
 5. Fabrication Method: Field-fabricated stick system.
- B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
- C. Steel Reinforcement: Manufacturer's standard.
- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

- E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials; Dead-soft, 0.018-inch-thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- G. Framing System Gaskets: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 1-3/4-inch thickness, with minimum 0.125-inch-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 2. Door Design: As indicated.
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

2.5 ENTRANCE DOOR HARDWARE

- A. General: Provide entrance door hardware for each entrance door to comply with requirements in this Section.
 - 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
 - 1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
 - 2. Exterior Hinges: Stainless steel, with stainless-steel pin.
 - 3. Quantities:
 - a. For doors up to 87 inches high, provide 3 hinges per leaf.
 - b. For doors more than 87 and up to 120 inches, provide 4 hinges per leaf.
- C. Manual Flush Bolts: BHMA A156.16, Grade 1.
- D. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Cylinders: BHMA A156.5, Grade 1.
 - 1. Keying: No master; Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE" to be furnished by Owner.

- F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- G. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to meet field conditions and requirements for opening force.
- H. Push Pull Hardware: Manufacturers' standard.
- I. Surface-Mounted Holders: BHMA A156.16, Grade 1.
- J. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- K. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Sliding Type: AAMA 701 made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- L. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- M. Silencers: BHMA A156.16, Grade 1.
- N. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.
- O. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.6 GLAZING

- A. Glass and Glazing: Manufacturer's standard glazing system that produces weathertight seal. Comply with requirements indicated in Section 088000 "Glazing."

2.7 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
- C. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."
- D. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Framing Members, General: 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. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from exterior; interior; interior for vision glass and exterior for spandrel glazing or metal panels.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- D. Storefront Framing: Fabricate components for assembly using shear-block system; screw-spline system; head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals or concrete, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
- C. Install components to drain water-passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet 1/4 inch over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
 - 1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of three tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
 - 2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - a. Perform a minimum of three tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
 - 3. Water Penetration: ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
- C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
 - 1. Test a minimum of four areas on each building facade.
 - 2. Repair installation areas damaged by testing.
- D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 084113

SECTION 085313 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes vinyl-framed windows.

1.2 CODE COMPLIANCE

- A. Windows shall meet the requirements of the Florida Building Code.
 - 1. Provide product evaluations and installation requirements indicating compliance with Code requirements.

1.3 SUBMITTALS

- A. Product Approval: Submit current Product Approval documentation in accordance with the Florida Building Code.
- B. Product Data: Submit window manufacturer current product literature, including installation instruction.
- C. Shop Drawings: Indicate location, size, and elevation of each kind of window; construction details not covered in Product Data; and other pertinent data.
- D. Samples: Provide finish samples for all products.
- E. Design Data: Provide manufacturer test report numbers indicating product compliance with indicated requirements.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify installation and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.

2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Building Code Requirements: Comply with the requirements of the Florida Building Code.
- B. General Performance: Comply with performance requirements specified, as tested representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 1. Withstand movements of supporting structure including, but not limited to, story drift, 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. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 1. Wind Loads: As indicated.
- D. Dimensional Tolerances: Provide glazing systems that accommodate dimensional tolerances of building frame and other adjacent construction.
- E. Thermal Movement: Provide for thermal movement caused by 180 degrees F. surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.
- F. Structural Loads:
 1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
 1. No evidence of water penetration when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
- H. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests according to ASTM E 1996 for Wind Zone as indicated.
 1. Large-Missile Test: For glazed openings located within 30 feet of grade.

2. Small-Missile Test: For glazed openings located more than 30 feet above grade.
- I. Thermal Performance Properties: Provide windows with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. U-Factors: according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 - a. As Indicated.
 2. Solar Heat-Gain Coefficient: according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - a. As Indicated.

2.2 VINYL WINDOWS

- A. Basis of Design Product and Manufacturer: Jeld-Wen, Premium Atlantic Vinyl, Single Hung.
- B. Basis of Design Product and Manufacturer: Jeld-Wen, Premium Atlantic Vinyl, fixed window.
- C. Frames and Sashes: complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 1. UV-stabilized PVC
 2. Finish: Integral color, white.
- D. Glass: Refer to section 088000 "Glazing."
- E. Hardware, General: Manufacturer's standard corrosion-resistant hardware sized to accommodate sash weight and dimensions.
 1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- F. Hung Window Hardware:
 1. Counterbalancing Mechanism: AAMA 902.
 2. Locks and Latches: Operated from the inside only; and shall meet the requirements of the Fair housing Act.
 3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis.
- G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 ACCESSORIES

- A. Dividers (False Muntins): Provide divider grilles in designs indicated for each sash lite.

2.4 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
 - 1. Type and Location: Full, outside for double-hung or Half, outside for single-hung sashes.
- B. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh complying with ASTM D 3656.

2.5 FABRICATION

- A. Fabricate windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- E. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- F. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

- G. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
 - 3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 - 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 - 5. Test Reports: Prepared according to AAMA 502.
- C. Manufacturer's Field Services: Provide periodic site visit by manufacturer's field service representative.
- D. Units will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 085313

SECTION 087100 - DOOR HARDWARE

PART 1 – GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Provide finish hardware items for aluminum, standard and custom steel and wood door openings.

B. RELATED SECTIONS

1. Section 06 10 00 – Rough Carpentry
2. Section 06 20 00 – Finished Carpentry
3. Section 07 92 00 – Joint Sealers – Exterior Thresholds
4. Section 08 11 00 – Metal Doors and Frames
5. Section 08 14 00 – Wood Doors
6. Section 08 41 00 – Entrances and Storefront
7. Section 09 90 00 – Painting and Coating
8. Section 26 20 00 – Low Voltage Electrical Distribution
9. Section 28 00 00 – Electronic Safety and Security

1.2 REFERENCES

- A. American National Standard Institute (ANSI) ANSI A117.1 2009 Accessible and Useable Buildings and Facilities.
- B. ANSI/BHMA A156.18 – 2006 Materials and Finishes
- C. National Fire Protection Association (NFPA)
 1. NFPA-80 Fire Doors and Other Opening Protective – 2013
 2. NFPA101 Life Safety Code, 2012
- D. Door and Hardware Institute (DHI)
 1. Installation Guide for Doors and Hardware, 1984
 2. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames, 1996
 3. Keying Systems and Nomenclature April 1999
 4. Sequence and Format for the Hardware Schedule, 2016

1.3 SUBMITTALS

- A. General Requirements: Coordinate and furnish Submittals under provisions of Section 01 33 00 – Administrative Requirements, for submittal procedures.
- B. Schedules:
 1. Furnish Submittal electronically in a vertical format, searchable and in Portable Document

Format (PDF) conforming to the DHI publication Sequence and Format for Hardware Schedule using Architect's door and hardware set numbers, index and abbreviation list. Group identical openings in hardware headings.

2. Provide in furnished Submittal Project Name, Date, name of contractor, entity who prepared the submittal and name of person who prepared submittal.
 3. Prior to submission, stamp each page of the hardware schedule with the seal from an Architectural Hardware Consultant (AHC) or Architectural Opening Consultant (AOC) who is enrolled in the DHI Continuing Education Program to demonstrate correctness and compliance with specification and project requirements.
- C. Product Data: Furnish manufacturer's data sheets on each product to be used, including: Preparation instructions and recommendations. Storage and handling requirements and recommendations. Installation methods. BHMA Finish codes per ANSI A156.18. Name, part number, and manufacturer of each item. Fasteners and Fastening requirements. Hardware mounting locations for door and frame sizes, handing, materials, fire rating and degrees of swing.
- D. Templates: Furnish in electronic format, the manufacturer's hardware template information upon receipt of approved hardware schedule to the doors and frame supplier(s) upon request. Include requirements for internal reinforcements required for surface mounted hardware.
- E. Wiring Diagrams: Furnish with each copy of the finish hardware schedule submission in paper format 11 x 17 inch and electronic format, operation description, elevation and riser wiring diagrams for door openings with electrified hardware or access control devices. Elevation drawings to include with operational description and approximate placement of components. Upon approval of finish hardware schedule, provide point-to-point wiring diagrams for each application.
- F. Keying Schedules: Upon approval of the finished hardware schedule, meet with Owner's representative to determine the project keying requirement. Keying information shall be formatted in accordance with DHI publication Keying Systems and Nomenclature, 1999.
- G. Samples:
1. Furnish with hardware submittal, one sample of each product requested by architect and one of each lock and lever style, exit device with trim lever style in finish as specified in hardware submittal. Approved samples are permitted to be used on the project. Samples once approved are to be returned to contractor for use on the project.
- H. Operations and Maintenance Manuals: Furnish operations and maintenance manual in accordance with Section 01 78 23 - Operations and Maintenance data as follows:
1. Furnish one copy of the manual at date of Substantial Completion in a binder labeled with project information to include date, name of furnishing contractor and entity contact information for hardware supplier.
 2. Include in manual:
 - a. Copy of approved hardware schedule, including door number and locations. Identify fire rated doors to aid in annual fire door inspection.
 - b. Copy of approved keying schedule.
 - c. Catalog data for each product.
 - d. As-installed "wiring diagrams" for each opening connected to power.
 - e. Parts list for locksets, exit devices, door closers, and auto door operations.
 - f. Installation templates and instructions.

g. Warranty information.

1.4 QUALITY ASSURANCE

- A. Supplier shall employ a certified Architectural Hardware Consultant (AHC) who shall be available during course of work for project hardware consultation to the project team and who shall administer and supervise project and who is enrolled in the DHI Continuing Education Program to demonstrate correctness and compliance with specification requirements.
- B. Installer shall be competently skilled in the installation methods and procedures for commercial doors, frames and hardware. Use appropriate tools, accessories and techniques to install finish hardware items.
- C. Pre-Installation Meeting: Prior to installation of hardware, meet with the installer and hardware supplier to review the door, frame and hardware requirements of the project. Provide installer with a copy of the approved finish hardware schedule. Review the manufacturers' installation instructions for each item of hardware. Send a letter of compliance, with date meeting held, who was in attendance, to the Architect.
- D. Fire Rated Door Openings:
 - 1. Hardware items installed on fire-rated door assemblies shall comply with NFPA 80 as tested and listed by the door, frame and hardware manufacturers.
 - 2. Latch bolt projections and assemblies, door closing devices and fire exit hardware shall bear labels or marks from testing as proof of compliance with fire-rated door assembly requirements. Fasteners used to attach hardware items to fire-rated door assemblies shall be of the types and sizes tested and recommended by the hardware manufacturer for each application.
 - 3. Provide fire exit hardware on door leaves bearing the label stating "Fire Door to be Equipped with Fire Exit Hardware"

1.5 SHIPPING, HANDLING, AND DELIVERY

- A. Marking and Packaging:
 - 1. Deliver hardware to jobsite in accordance with Section 01 60 00 (Products) in one shipment in manufacturer's original packaging marked to correspond with approved hardware schedule with Architect's door numbers and hardware sets.
 - 2. Mark locksets, exit devices, cylinders, auxiliary hardware and key switches with keyset number.
- B. JSN Site Delivery: Jointly check and inspect hardware upon delivery to jobsite inspecting against approved hardware schedule with hardware supplier. Discrepancies or shortages to be corrected to meet construction schedule. Replace wet or damaged packaging with new product to meet construction schedule.
- C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc. Damaged material to include degraded finishes shall be replaced with new material. Store hardware items off the floor on shelving. Store large items of hardware (exit devices, door operators, thresholds, and seals) on wooden pallets. Arrange locksets and keyed cylinders by door opening number. Arrange all remaining hardware by hardware set number.

1.6 WARRANTY

- A. See Section 01 7800 - Warranty & Closeout Submittals, for additional warranty 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. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

1.7 MAINTENANCE AND SERVICE CONTRACTS

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers are acceptable for use on the project. Provide like items of hardware from one of the manufacturers listed.

1. Hinges	Pamex
2. Flush Bolts	Pamex
3. Coordinators	Pamex
4. Locksets and Levers	Pamex
5. Deadbolts	Pamex
6. Cylinders	Pamex/Adam's Rite
7. Electric Strikes	HES
8. Exit Devices	Pamex
9. Overhead Stops	Pamex
10. Surface Door Closers	Pamex
11. Pulls	Trimco
12. Door Stops	Pamex
13. Magnetic Hold Open	Pamex
14. Silencers	Pamex
15. Door Viewers	Trimco
16. Latch Guard	Pamex
17. Power Transfer Device	Pamex
18. Protection Plates	Pamex
19. Mag Lock	SDC
20. Request to Exit Buttons	SDC
21. Seals, Weatherstrips, Thresholds	Reese
22. Mortise Accessories	Adam's Rite
23. Credential Reader	By Division 28
24. Power Supply	By Division 28
25. Overhead Door Hardware	By Overhead Door Mfr
26. Chute Door Hardware	By Chute Door Mfr

2.2 SUBSTITUTIONS

- A. Submit requests for substitution in accordance with Section 01 25 13 Product Substitution.

2.3 MATERIALS

- A. SCREWS AND FASTENERS

Provide manufacturers recommended. Means of fastening for each application. Surface mounted hardware items applied to door leaves shall be attached with the appropriate fasteners without sex or grommet nuts. Exposed fasteners shall match finish of hardware item.

B. HINGES

1. Conventional Hinges

Provide five knuckle, steel base, full mortise, ball bearing hinges. Size hinges for height and weight in accordance with manufacturer's recommendations for appropriate applications and frequency of use. Hinges shall be sized in width to minimally clear trim. Include non-removable pin (NRP) at locking doors with reverse bevel. Provide 2 hinges for doors up to 5 feet in height, with one additional hinge for every 2'6" in height, or fraction thereof.

2. Provide hinges manufactured by Pamex.

Function	Part Number
a. Standard Weight	H45-02RBL, H44-12RBL
b. Standard Weight, NRP	H45-02NBL, H44-12NBL
c. Continuous Hinge	HCFM110, HCFM110EPT
d. Electric Hinge	EPT-H100B

C. DEADBOLTS

1. Heavy Duty Deadbolts – Grade 2

Provide deadbolt series conforming with ANSI/BHMA A156.2 and function as specified. Deadbolts shall have an adjustable backset. Latch bolt shall have 1 inch throw.

Function	Part Number
a. Single Cylinder	FD791

2. Medium Duty Deadbolts – Grade 3

Provide deadbolt series conforming with ANSI/BHMA A156.2 and function as specified. Deadbolts shall have an adjustable backset. Latch bolt shall have 1 inch throw.

Function	Part Number
a. Single Cylinder	FD291
b. One-Sided Deadbolt	FD294

D. CYLINDERS

Conventional mortise and rim cylinders as appropriate for scheduled locks, exit devices, key switches, and auxiliary hardware. Provide correct mortise cylinders with required length, cam, tail piece and collar for scheduled hardware. Provide Cylinders in Schlage 6-Pin.

Function	Part Number
a. Rim Cylinder	E9100/RCSC
b. Mortise Cylinder	E9100/MCSC

E. FLUSHBOLTS

Provide automatic, constant latching, and manual flush bolts. Provide 12 inch rods at doors up to 90 inches in height. For doors over 90 inches in height increase rod length by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.

Function	Part Number
a. Manual Latching Flush Bolt	DD05-63

F. COORDINATORS

Where pairs of doors are equipped with automatic flush bolts, an astragal or other hardware that requires synchronized closing, provide bar-type coordinating device, surface applied to underside of stop at frame head. Provide filler bar to span entire width of opening and mounting brackets for other hardware installed at frame head.

Function	Part Number
a. Door Coordinator	E4000/DC52
b. Filler Bar	E4000/FB18
c. Mounting Bracket	E4000/MB3

G. BORED LOCKS

1. Electrified Cylindrical Lever Locks – Grade 1

Cylindrical locks and latches shall be heavy duty models, handed for each opening. Lock lever shall be brass base material. Provide latch bolts with appropriate latch or bolt throw dimension for fire rated openings in accordance with manufacturers' listings.

Function	Part Number
a. Fail-Safe Storeroom	FYS95CE-SA
b. Fail-Secure Storeroom	FYS95CE-SE

2. Cylindrical Lever Locks – Grade 2

Cylindrical locks and latches shall be heavy duty models, handed for each opening. Lock lever shall be brass base material. Provide latch bolts with appropriate latch or bolt throw dimension for fire rated openings in accordance with manufacturers' listings.

Function	Part Number
a. Entry	FYF90C
b. Privacy	FYF91C
c. Passage	FYF93C
d. Storeroom	FYF9SC

3. Lever sets – Grade 3

Lever sets shall be handed for each opening and used within apartment dwelling units. Lock and latch lever shall be cast zinc base material. Locks and latches shall have adjustable backset. Provide latch bolts with ½ inch throw. Privacy sets in unit bedrooms and bathrooms shall be operable without pinching or twisting of the wrist.

Function	Part Number
a. Passage	FLT903C

- | | |
|------------|---------|
| b. Privacy | FLT908C |
| c. Dummy | FLT904 |

H. EXIT DEVICES

Provide fire exit and panic hardware devices properly handed and sized for each door application. Non-fire rated exit devices shall have cylinder-dogging feature. Include appropriate strikes to suit door, frame and floor conditions. Where required by application, include manufacturer's recommended shims for proper installation. Sized appropriately for application, door width, door height, and door thickness. Single doors to receive rim exit device and pairs of doors to surface vertical rod exit device, For Less bottom rod applications at fire rated openings auxiliary fire bolts for less bottom rod (LBR) devices. Trim to match cylindrical lever lock trim unless otherwise specified.

Function	Part Number
a. Rim Fire Exit Device	EF9000/EO3
b. Rim Fire Exit Device, ELR	EF900E/EO3
c. Rim Panic Device, ELR	E910E/EO3
d. SVR Panic Device	E9000V/EO3X7
e. SVR Fire Exit Device, LBR	EF9000V/LBR37
f. CVR Panic Device, ELR	E912EV/EO3X7

I. OVERHEAD STOPS AND HOLDERS

Provide heavy or medium duty overhead stop or holder where the door opens against equipment, casework, side lights, where conditions do not allow wall stop or where a floor stop presents a tripping hazard.

Function	Part Number
a. Overhead Stop	DD08-13__36

J. SURFACE DOOR CLOSERS

Surface mounted door closers shall be properly handed, sized and have appropriate arms, auxiliary mounting brackets, spacers and fasteners to permit installation on room side of door opening out of public view as recommended by manufacturers for the applications used. Provide Arms of the appropriate length for regular arm and top jamb applications. Closers shall have full covers. Closers installed on interior non-fire rated openings shall have reduced opening spring power to meet accessibility requirements. Closers installed on fire-rated and exterior opening shall have the minimum spring power necessary to properly close and overcome latch-bolt friction and building stack pressures. Provide closers with hydraulic back-check feature and delayed action where specified.

Function	Part Number
a. Surface Closer	GC4400BF
b. Surface Closer	GC5900BF
c. Surface Closer, Delayed Action	GC5900BFDA
d. Surface Closer	GC8716BF

K. PROTECTION PLATES

Provide 0.050 inch thick plates, beveled four edges, fastener holes countersunk. On fire rated doors provide UL embossed seal where top of plate is more than 16 inches above the bottom of the door. Mop plates sized 4 inch high and 1 inch less than door width. Kick plates sized 10 inch high sized 1-1 inch less door. Where bottom rail of door will not allow specified protection plate height, size height to 1 inch less than height of bottom rail. Armor plates sized 34 inches high and coordinate width with edge guards.

Function	Part Number
a. Kick Plate	DD09-301034
b. Mop Plate	DD09-30434

L. DOOR STOPS

1. Wall Bumpers

Provide matte black wall stops with convex or concave bumper as needed.

Function	Part Number
a. Wall stop, Concave	DD02-53

2. Floor Stop

Provide matte black floor stops as needed.

Function	Part Number
a. High Profile	DD02-63

3. Hinge Pin Stops

Provide matte black hinge pin stops used with hinges as needed.

Function	Part Number
a. Hinge Pin Stop	DD02-40

4. Spring Stop

Provide matte black spring stops used with doors as needed

Function	Part Number
a. Spring Stop	DD02-31

b. MAGNETIC HOLDER OPEN

Provide wall mounted electromagnetic door release as specified with a minimum of 30 pounds of holding force. Connect magnetic holders at corridor double egress or cross-corridor doors into fire alarm system to release hold open upon fire alarm, smoke alarm or fire sprinkler activation or loss of building power:

Function	Part Number
a. Magnetic Holder	EMH-S24120

c. MISCELLANEOUS HARDWARE

1. Ball Catches

Provide Pamex DD05-30 roller catch at non latching closet doors in residential units. Two catches for pairs of doors, one catch for single doors.

2. Silencers

Provide silencers at swinging doors not schedule to have perimeter Gasketing or smoke seals. 6 silencers for pairs of doors, 3 silencers for single doors.

Function	Part Number
a. Wood Frame Silencer	DD02-82

2.4 FINISHES

Provide hardware with finishes conforming to BHMA A156.18

- A. Exterior Hinges, Steel Base 631
- B. Interior Commons Hinges 631
- C. Interior Dwelling Unit Hinges 613/631
- D. Continuous Hinges 710
- E. Residential Latches 622
- F. Common Area Locks and Latches 622
- G. Closers 693
- H. Exit Devices 622
- I. Pulls 613
- J. Electric Strike BLK
- K. Flush Bolts 622
- L. Door Stop 622/626/631
- M. Protection Plates 613
- N. Misc. Hardware 335/613/622/710/BLK/GRY

2.5 KEYING

- A. Factory key locks and cylinders to new, Schlage 6-Pin Conventional Cylinder. Master key system designed to allow for expansion of 10 master keys and 150 change keys. Mark keyset number on core body and key bow. Furnish visual key control stamp the key bow with keyset symbol and "Do Not Duplicate". Deliver master keys and bitting list to Owner via Certified Mail with return receipt requested. Furnish Provide the following minimum number of keys: Three (3) Grand Master Keys, three (3) Master Keys per Master Key Group, ten (10) Construction Keys.

2.6 KEY CONTROL

- A. Provide wall mounted key cabinet with 2-tag key system sized for up to 350 keys. Create a card index, properly label keys, and place in cabinet. Deliver to Owner at substantial completion. Instruct Owner on using and maintain key control system.

- 1. Lund 1205

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Prior to installation of door hardware, verify conditions are satisfactory for installing finish hardware. Before hardware is installed, wash down of masonry work and painting or staining of doors and frames shall be completed. Verify door frames are installed level, plumb, square and true. Correct door frame installation before proceeding with installation of finish hardware.

3.2 INSTALLATION

- A. Fasteners: Use only fasteners furnished by manufacturer for installation as recommended by manufacturer. Drill and countersink items not factory prepared for fasteners.
- B. Hardware Mounting Heights: Install hardware in compliance with the DHI publication, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames. With the following exceptions:
 - 1. Kick plates installed flush to bottom of door.
- C. Clearances: Install fire door and non-rated door assemblies to maintain clearances at door edge to frame and meeting edge of pairs of doors in compliance with NFPA 80.
- D. Door Closers: Mount closers out of site and public view using arms, brackets to suite the application.
- E. Thresholds and Saddles: Install weather-strip prior to installation of door closers and exit devices without cutting or notching weather-strip. Trim, cut and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Install thresholds and saddles in a bed of silicon caulking, completely sealing the underside from water and air penetration.
- F. Seals shall be installed to ensure a continuous seal around the perimeter of the opening.
- G. Wall Stops: Provide wall blocking at wall stop locations.

3.3 FIELD QUALITY CONTROL

- A. Prior to Substantial completion, secure the services of:
 - 1. An AHC to inspect openings. Replace or repair door hardware found to be defective inoperable, or not in compliance with submittals. Verify door open and close smoothly without rubbing or catching and have positive latching where scheduled.
 - 2. A Fire Door Assembly Inspector (FDAI) to inspect fire rated openings to conformance with NFPA 80 Inspections and Testing. Replace or repair door hardware found to be defective, inoperable, or not in compliance with NFPA 80 Inspection and Testing. Verify door open and close smoothly without rubbing or catching and have positive latching as scheduled.
- B. Test electrified hold open devices tied into fire alarm system to confirm release upon activation of fire alarm. Test delayed egress systems to ensure time delay and release are in compliance with local code requirements. Test electrified hardware an access control to verify systems operate as directed in mode of operation. Where hardware is found to inoperable, repair or replace with new.

3.4 DEMONSTRATION

- 1. Demonstrate mechanical hardware and electrical, electrical and pneumatic hardware systems function correctly and to Owners intended design.
- B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Defects shall be corrected by adjusting doors, hardware or replacing defective material at no expense to Owner

3.5 ADJUSTING AND CLEANING

- A. Upon Substantial completion, after balance of heating and ventilation equipment, make final adjustment to hardware and door opening so that door opens, closes, and fully and properly latches, free of binding, bowing or any such way that damages the door or hardware.
 1. Adjust door control devices to compensate for final operation of HVAC system and to comply with ANSI117.1 accessibility requirements
 2. Clean pencil or tool marks from adjacent surfaces damaged or soiled by work of this Section following manufacturer's recommended procedures.
 3. Clean and polish exposed hardware in accordance with manufacturer's recommended procedures so that hardware shall be free from disfigurement. Any hardware found to be disfigured shall be replaced at no cost to the owner.
 4. Recycle cardboard boxes and paper products used in packaging and transport of finish hardware.

3.6 PROTECTION

- A. Remove hardware prior to painting, finish and modifying door and frame and reinstall once complete. Wrap or mask exposed hardware with Kraft paper or bubble wrap that cannot be removed, to avoid exposure to paint, solvents, and abuse.
- B. Protect fire labels on hardware with plastic or Kraft paper to avoid, voiding label.
- C. Remove field and factor applied paper, plastic, and film at Substantial Completion.
- D. Repair or replace hardware damaged during construction at least two weeks prior to date of substantial completion.

HARDWARE SCHEDULE

COMMONS

HW SET: 01 DOOR: 101 (INTERIOR STAIR ENTRY, CORRIDOR ENTRY FROM STAIRS)

	3'0" X 6'8" HMD X HMF 90 MIN			
1	CONT. HINGE, FULL MORTISE GEARED	HCFM110EPT-83DB	710	PAMEX
1	POWER TRANSFER DEVICE	EPT-M10DB	613	PAMEX
1	RIM FIRE EXIT DEVICE	EF9000/EO3-BL	622	PAMEX
1	EXIT TRIM, FAIL SAFE STOREROOM	E9000/LFSA-BL	622	PAMEX
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	WALL STOP	DD02-53BL	622	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	323B	335	REESE
1	THRESHOLD	S205D	710	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 02 DOOR: 101 (VESTIBULE TO CORRIDOR ENTRY)

3'0" X 6'8" HMD X HMF 90 MIN

1	CONT. HINGE, FULL MORTISE GEARED	HCFM110EPT-83DB	710	PAMEX
1	POWER TRANSFER DEVICE	EPT-M10DB	613	PAMEX
1	FAIL SAFE STOREROOM	FYS95CE-SA	622	PAMEX
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	323B	335	REESE
1	THRESHOLD	S205D	710	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 03 DOOR: 102 (MEP, MECH, LOW VOLTAGE)

3'0" X 6'8" HMD X HMF 45 MIN

3	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" NRP	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	ELECTRIC STRIKE	8300	BLK	HES
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA590-BL	693	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 04 DOOR: 102 (JANITOR'S CLOSET)

3'0" X 6'8" HMD X HMF 45 MIN

3	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5"	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	WALL STOP	DD02-53BL	622	PAMEX
1	SMOKE SEAL	797B	BLK	REESE

HW SET: 05 DOOR: 102 (MEN & WOMEN'S RESTROOM)

3'0" X 6'8" HMD X HMF 45 MIN

3	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5"	631	PAMEX
1	PASSAGE LEVERSET	FYF93C	622	PAMEX

1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	FLOOR STOP	DD02-63BL	622	PAMEX
1	KICK PLATE	DD09-301034OB	613	PAMEX
1	MOP PLATE	DD09-30434OB	613	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	THRESHOLD	S205D	710	REESE

HW SET: 06 DOOR: 102 (CHEMICAL STORAGE)

3'0" X 6'8" HMD X HMF 45 MIN

3	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5"	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	WALL STOP	DD02-53BL	622	PAMEX
1	SMOKE SEAL	797B	BLK	REESE

HW SET: 07 DOOR: 102 (STAIR # G2, STAIR #G1 - 2ND FLOOR AND HIGHER, VESTIBULE ENTRY - 2ND FLOOR AND HIGHER)

3'0" X 6'8" HMD X HMF 45 MIN

1	CONT. HINGE, FULL MORTISE GEARED	HCFM110-83DB	710	PAMEX
1	RIM FIRE EXIT DEVICE	EF9000/EO3-BL	622	PAMEX
1	EXIT TRIM, PASSAGE	E9000/LFPA-BL	622	PAMEX
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	CUSH-N-STOP OR WALL STOP	GCNSA440-BL OR DD02-53BL (AS REQ'D)	693/622	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	323B	335	REESE
1	THRESHOLD	S205D	710	REESE

HW SET: 08 DOOR: 102 (STAIR # G3)

3'0" X 6'8" HMD X HMF 45 MIN

1	CONT. HINGE, FULL MORTISE GEARED	HCFM110EPT-83DB	710	PAMEX
1	POWER TRANSFER DEVICE	EPT-M10DB	613	PAMEX
1	RIM FIRE EXIT DEVICE, ELR	EF900E/EO3-BL	622	PAMEX
1	EXIT TRIM, STOREROOM	E9000/LFS-BL	622	PAMEX
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	354D	710	REESE
1	THRESHOLD	S205D	710	REESE
1	RAIN DRIP	R201B (AS REQ'D)	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		

1 POWER SUPPLY BY DIVISION 28

HW SET: 09 DOOR: 102 (VESTIBULE ENTRANCE - GROUND FLOOR)

3'0" X 6'8" HMD X HMF 45 MIN

1	CONT. HINGE, FULL MORTISE GEARED	HCFM110-83DB	710	PAMEX
1	POWER TRANSFER DEVICE	EPT-M10DB	613	PAMEX
1	RIM FIRE EXIT DEVICE, ELR	EF900E/EO3-BL	622	PAMEX
1	EXIT TRIM, STOREROOM	E9000/LFS-BL	622	PAMEX
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	323B	335	REESE
1	THRESHOLD	S205D	710	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 10 DOOR: 102 (STAIR EXIT FROM VESTIBULE - FIRST FLOOR)

3'0" X 6'8" HMD X HMF 45 MIN

1	CONT. HINGE, FULL MORTISE GEARED	HCFM110EPT-83DB	710	PAMEX
1	RIM FIRE EXIT DEVICE	EF9000/EO3-BL	622	PAMEX
1	EXIT TRIM, PASSAGE	E9000/LFPA-BL	622	PAMEX
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	323B	335	REESE
1	THRESHOLD	S205D	710	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 11 DOOR: 102 (MAINTENANCE)

3'0" X 6'8" HMD X HMF 45 MIN

3	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" BB NRP	631	PAMEX
1	STOREROOM LEVERSET	FYF9SC	622	PAMEX
1	ELECTRIC STRIKE	8300	BLK	HES
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA590-BL	693	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	323B	335	REESE
1	THRESHOLD	S205D	710	REESE
1	LATCH GUARD	DD10-11DB	613	PAMEX
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 12 DOOR: 103 (MECH ROOM - IN STORAGE, FITNESS, AND PACKAGE ROOM)

	3'0" X 6'8" WDD X WDF			
3	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" NRP	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	WALL STOP	DD02-53BL	622	PAMEX
3	SILENCERS	DD02-82	GRY	PAMEX

HW SET: 13 DOOR: 103, 116 (MECH ROOM - IN CORRIDOR, MECH ROOM - IN CLUBHOUSE)

	3'0" X 6'8" WDD X WDF			
	2'6" X 6'8" WDD X WDF			
3	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" NRP	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	OVERHEAD STOP	DD08-13S36BL	631	PAMEX
3	SILENCERS	DD02-82	GRY	PAMEX

HW SET: 14 DOOR: 104 (EXTERIOR STAIR ENTRY/POOL ACCESS)

	3'0" X 8'0" WDD/GLS X WDF			
1	CONT. HINGE, FULL MORTISE GEARED	HCFM110EPT-95DB	710	PAMEX
1	POWER TRANSFER DEVICE	EPT-M10DB	613	PAMEX
1	RIM PANIC DEVICE, ELR	E910E/EO3-BL	622	PAMEX
1	EXIT TRIM, NIGHT LATCH	E9100/RCSC-BL	622	PAMEX
1	OFFSET PULL	1191-4	613	TRIMCO
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	DROP BRACKET PLATE	GFDB442-BL	693	PAMEX
1	BLADE STOP SPACER	GBSS440-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX

1	WEATHERSTRIPING	854D	710	REESE
1	DOOR SWEEP	354D	710	REESE
1	THRESHOLD	S205D	710	REESE
1	RAIN DRIP	R201B (AS REQ'D)	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		
HW SET: 15	DOOR: 105 (LOADING BAY)			
	3'0" X 6'8" PAIR HMD X HMF			
6	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" NRP	631	PAMEX
2	SVR PANIC DEVICE	E9000V/EO3X7-BL	622	PAMEX
1	EXIT TRIM, STOREROOM	E9000/LFS-BL	622	PAMEX
2	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
2	CUSH N STOP ARM	GCNSA590-BL	693	PAMEX
2	PERIMETER SEAL	797B	BLK	PAMEX
HW SET: 16	DOOR: 105 (BIKE STORAGE)			
	3'0" X 6'8" PAIR HMD X HMF			
6	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" NRP	631	PAMEX
2	MANUAL FLUSH BOLT	DD05-63BL	622	PAMEX
1	DUST PROOF STRIKE	DD05-603BL	622	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
2	OVERHEAD STOP	DD08-13S36BL	631	PAMEX
1	ASTRAGAL SEAL	183D	710	REESE
2	WEATHERSTRIPING	854D	710	REESE
2	DOOR SWEEP	323B	335	REESE
1	THRESHOLD	S205D	710	REESE
HW SET: 17	DOOR: 106 (CORRIDOR)			
	3'0" X 6'8" HMD X HMF 45 MINS			
3	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" NRP	631	PAMEX
1	RIM FIRE EXIT DEVICE	EF9000/EO3-BL	622	PAMEX
1	EXIT TRIM, PASSAGE	E9000/LHPA-BL	622	PAMEX
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	CUSH-N-STOP OR WALL STOP	GCNSA590-BL OR DD02- 53BL (AS REQ'D)	693/622	PAMEX
1	SMOKE SEAL	797B	BLK	REESE

HW SET: 18 DOOR: 107 (FIRE DOOR)

3'0" X 6'8" PAIR HMD X HMF

6	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" BB NRP	631	PAMEX
2	SVR FIRE EXIT DEVICE, LBR	EF9000V/LBR37-BL	622	PAMEX
2	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
2	MAGNETIC HOLD OPEN	EMH-S24120AL	626	PAMEX
1	ASTRAGAL SEAL	793B	BLK	REESE
2	SMOKE SEAL	797B	BLK	REESE

HW SET: 19 DOOR: 108, 114 (LOADING BAY EXTERIOR, TRASH COMPACTOR EXTERIOR)

12'0" X 16'0" STLD X STLF

15'0" X 16'0" STLD X STLF

1	OVERHEAD DOOR HARDWARE	BY OVERHEAD DOOR MFR		
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HW SET: 20 DOOR: 109 (EXTERIOR CORRIDOR ENTRY)

3'0" X 8'0" HMD X HMF 45 MIN

1	CONT. HINGE, FULL MORTISE GEARED	HCFM110-95DB	710	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	ELECTRIC STRIKE	8300	BLK	PAMEX
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	354D	710	REESE
1	THRESHOLD	S205D	710	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 21 DOOR: 109 (MECH CLOSET?)

3'0" X 8'0" HMD X HMF 45 MIN

4	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" BB NRP	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX

1	CUSH-N-STOP ARM	GCNSA590-BL	693	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
HW SET: 22 DOOR: 110 (FITNESS)				
3'0" X 8'0" ALD/GLS X ALF				
4	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5" BB	631	PAMEX
1	MORTISE DEADLATCH	4510	335	ADAM'S RITE
1	MORTISE CYLINDER	E9100/MCSC-BL	622	PAMEX
1	OFFSET PULL	1191-4	613	TRIMCO
1	DEADLATCH HANDLE	4568	335	ADAM'S RITE
1	ELECTRIC STRIKE	8500	613	HES
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	DROP BRACKET PLATE	GFDB590-BL	693	PAMEX
1	BLADE STOP SPACER	GBSS590-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA590-BL	693	PAMEX
1	PERIMETER SEAL	BY DR + FRM SUPPLIER	---	---
1	POWER SUPPLY	BY DIVISION 28		
1	CREDENTIAL READER	BY DIVISION 28		
HW SET: 23 DOOR: 110 (YOGA)				
3'0" X 8'0" ALD/GLS X ALF				
4	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5" BB	631	PAMEX
1	PUSH/PULL COMBO	1738	622	TRIMCO
1	WALL STOP	DD02-53BL	622	PAMEX
1	PERIMETER SEAL	BY DR + FRM SUPPLIER	---	---
HW SET: 24 DOOR: 110 (MANAGER'S OFFICE, ASSISTANT MANAGER'S OFFICE)				
3'0" X 8'0" ALD/GLS X ALF				
4	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5" BB	631	PAMEX
1	MORTISE INTERCONNECTED	2190 (WITH MD LEVER)	613	ADAM'S RITE
1	MORTISE CYLINDER	E9100/MCSC-BL	622	PAMEX
1	THUMBTURN CYLINDER	4066	335	ADAM'S RITE
1	WALL STOP	DD02-53BL	622	PAMEX
1	PERIMETER SEAL	BY DR + FRM SUPPLIER	---	---

HW SET: 25 DOOR: 110 (POOL EQUIPMENT)

3'0" X 8'0" ALD/GLS X ALF				
4	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5"	631	PAMEX
		BB NRP		
1	MORTISE DEADLATCH	4510	335	ADAM'S RITE
1	MORTISE CYLINDER	E9100/MCSC-BL	622	PAMEX
1	OFFSET PULL	1191-4	613	TRIMCO
1	DEADLATCH HANDLE	4568	335	ADAM'S RITE
1	ELECTRIC STRIKE	8500	613	HES
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	DROP BRACKET PLATE	GFDB590-BL (AS REQ'D)	693	PAMEX
1	BLADE STOP SPACER	GBSS590-BL (AS REQ'D)	693	PAMEX
1	CUSH N STOP ARM	GCNSA590-BL	693	PAMEX
1	WEATHERSTRIPING	BY ALUM DR + FRM SUPPLIER	---	---
1	DOOR SWEEP	354D	710	REESE
1	THRESHOLD	S205D	710	REESE
1	RAIN DRIP	R201B (AS REQ'D)	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 26 DOOR: 110 (EXIT TO POOL COURTYARD)

3'0" X 8'0" ALD/GLS X ALF				
1	CONT. HINGE, FULL MORTISE GEARED	HCFM110EPT-95DB	710	PAMEX
1	POWER TRANSFER DEVICE	EPT-M10DB	613	PAMEX
1	RIM PANIC DEVICE, ELR	E910E/EO3-BL	622	PAMEX
1	EXIT TRIM, NIGHT LATCH	E9100/RCSC-BL	622	PAMEX
1	OFFSET PULL	1191-4	613	TRIMCO
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	DROP BRACKET PLATE	GFDB442-BL	693	PAMEX
1	BLADE STOP SPACER	GBSS440-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
1	WEATHERSTRIPING	BY ALUM DR + FRM SUPPLIER	---	---
1	DOOR SWEEP	354D	710	REESE
1	THRESHOLD	S205D	710	REESE
1	RAIN DRIP	R201B (AS REQ'D)	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 27 DOOR: 110 (MAIL ROOM)

3'0" X 8'0" ALD/GLS X ALF

1	CONT. HINGE, FULL MORTISE GEARED	HCFM110-95DB	710	PAMEX
1	MORTISE DEADLATCH	4510	335	ADAM'S RITE
1	MORTISE CYLINDER	E9100/MCSC-BL	622	PAMEX
1	OFFSET PULL	1191-4	613	TRIMCO
1	DEADLATCH HANDLE	4568	335	ADAM'S RITE
1	ELECTRIC STRIKE	8500	613	HES
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	DROP BRACKET PLATE	GFDB442-BL	693	PAMEX
1	BLADE STOP SPACER	GBSS440-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
1	WEATHERSTRIPING	BY ALUM DR + FRM SUPPLIER	---	---
1	DOOR SWEEP	354D	710	REESE
1	THRESHOLD	S205D	710	REESE
1	RAIN DRIP	R201B (AS REQ'D)	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 28 DOOR: 111 (MECH ROOM IN CLUBHOUSE AREA)

2'6" X 6'8" PAIR WDD X WDF

6	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" NRP	631	PAMEX
1	MANUAL FLUSH BOLT	DD05-63BL	622	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
2	OVERHEAD STOP	DD08-13S36BL	631	PAMEX
4	SILENCERS	DD02-82	GRY	PAMEX

HW SET: 29 DOOR: 111 (MECH ROOM IN YOGA ROOM)

2'6" X 6'8" PAIR WDD X WDF

6	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" BB NRP	631	PAMEX
1	MANUAL FLUSH BOLT	DD05-63BL	622	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	OVERHEAD STOP	DD08-13S36BL	631	PAMEX

1	WALL STOP	DD02-53BL	622	PAMEX
4	SILENCERS	DD02-82	GRY	PAMEX
HW SET: 30 DOOR: 112 (TRASH COMPACTOR ACCESS ROOM)				
3'0" X 8'0" HMD X HMF 90 MIN				
4	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5" BB	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	ELECTRIC STRIKE	8300	BLK	HES
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	WALL STOP	DD02-53BL	622	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		
HW SET: 31 DOOR: 112 (CORRIDOR ENTRY FROM PARKING DECK)				
3'0" X 8'0" HMD X HMF 90 MIN				
1	CONT. HINGE, FULL MORTISE GEARED	HCFM110EPT-95DB	710	PAMEX
1	POWER TRANSFER DEVICE	EPT-M10DB	613	PAMEX
1	FAIL SAFE STOREROOM	FYS95CE-SA	622	PAMEX
1	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
1	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	323B	335	REESE
1	THRESHOLD	S205D	710	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		
HW SET: 32 DOOR: 113 (PUMP ROOM)				
3'0" X 6'8" PAIR HMD X HMF				
5	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5" BB NRP	631	PAMEX
1	ELECTRIC HINGE	EPT-H10OB	613	PAMEX
2	MANUAL FLUSH BOLT	DD05-63BL	622	PAMEX
1	DUST PROOF STRIKE	DD05-603BL	622	PAMEX
1	FAIL SECURE STOREROOM	FYS95CE-SE	622	PAMEX
1	DOOR COORDINATOR	E4000/DC52-BL	622	PAMEX
1	FILLER BAR	E4000/FB18-BL	622	PAMEX

1	MOUTING BRACKET	E4000/MB3	BLK	PAMEX
2	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
2	CUSH N STOP ARM	GCNSA590-BL	693	PAMEX
1	ASTRAGAL SEAL	183D (AS REQ'D)	710	REESE
2	WEATHERSTRIPING	854D	710	REESE
2	DOOR SWEEP	323B	335	REESE
1	THRESHOLD	S205D	710	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 33 DOOR: 115 (BIKE STORAGE CHUTE DOOR)
3'0" X 3'0" HMD X HMF 45 MIN

1	CHUTE DOOR HARDWARE	BY CHUTE DOOR MFR		
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HW SET: 34 DOOR: 1001 (LEASING ENTRY, BUS LOBBY, CLUBHOUSE ENTRY)
2'10" X 6'8" PAIR WDD/GLS X WDF

2	CONT. HINGE, FULL MORTISE GEARED	HCFM110EPT-83DB	710	PAMEX
2	POWER TRANSFER DEVICE	EPT-M10DB	613	PAMEX
2	CVR PANIC DEVICE, ELR	E912EV/EO3X7-DB	613	PAMEX
1	EXIT TRIM, NIGHT LATCH	E9100/RCSC-DB	613	PAMEX
2	OFFSET PULL	1191-4	613	TRIMCO
2	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
2	DROP BRACKET PLATE	GFDB442-BL	693	PAMEX
2	BLADE STOP SPACER	GBSS440-BL	693	PAMEX
2	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
2	WEATHERSTRIPING	854D	710	REESE
2	DOOR SWEEP	354D	710	REESE
1	THRESHOLD	S205D	710	REESE
1	RAIN DRIP	R201B (AS REQ'D)	BLK	REESE
1	POWER SUPPLY	BY DIVISION 28		
1	CREDENTIAL READER	BY DIVISION 28		

HW SET: 35 DOOR: 1001 (BUSINESS CENTER)
2'10" X 6'8" PAIR WDD/GLS X WDF

2	CONT. HINGE, FULL MORTISE GEARED	HCFM110-83DB	710	PAMEX
1	MORTISE DEADLOCK	MS1850S	335	ADAM'S RITE

1	MORTISE CYLINDER	E9100/MCSC-BL	622	PAMEX
1	THUMBTURN CYLINDER	4066	335	ADAM'S RITE
1	MAG LOCK	1572Y	335	SDC
2	PUSH/PULL COMBO	1738	622	TRIMCO
2	SURFACE CLOSER	GC4400BF-BL	693	PAMEX
2	DROP BRACKET PLATE	GFDB442-BL	693	PAMEX
2	BLADE STOP SPACER	GBSS440-BL	693	PAMEX
2	CUSH N STOP ARM	GCNSA440-BL	693	PAMEX
2	WEATHERSTRIPING	854D	710	REESE
2	DOOR SWEEP	354D	710	REESE
1	THRESHOLD	S205D	710	REESE
1	RAIN DRIP	R201B (AS REQ'D)	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	REQUEST TO EXIT BUTTON	422C	613	SDC
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 36 DOOR: 1002 (OFFICE, CONFERENCE ROOM)

	2'10" X 6'8" WDD X WDF			
3	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5" BB	631	PAMEX
1	ENTRY LOCKSET	FYF90C	622	PAMEX
1	WALL STOP OR OVERHEAD STOP	DD02-53BL OR DD08- 13S36BL (AS REQ'D)	622/631	PAMEX
3	SILENCERS	DD02-82	GRY	PAMEX

HW SET: 37 DOOR: 1002 (RESTROOM IN BUSINESS CENTER)

	2'10" X 6'8" WDD X WDF			
3	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5" BB	631	PAMEX
1	PRIVACY LOCKSET	FYF91C	622	PAMEX
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	WALL STOP	DD02-53BL	622	PAMEX
1	KICK PLATE	DD09-301034OB	613	PAMEX
1	MOP PLATE	DD09-30434OB	613	PAMEX
1	PERIMETER SEAL	797B	BLK	REESE
1	THRESHOLD	S205D	710	REESE

HW SET: 38 DOOR: 1002 (BIKE STORAGE)

	2'10" X 6'8" WDD X WDF			
3	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5" BB	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	ELECTRIC STRIKE	8300	BLK	HES
1	SURFACE CLOSER, DELAYED ACTION	GC5900BFDA-BL	693	PAMEX
1	WALL STOP	DD02-53BL	622	PAMEX
1	PERIMETER SEAL	797B	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 39 DOOR: 1002 (PET SPA, STORAGE ROOM, WORK ROOM, A/V ROOM, PACKAGE ROOM)

	2'10" X 6'8" WDD X WDF			
3	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5" BB	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	ELECTRIC STRIKE	8300	BLK	HES
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	WALL STOP	DD02-53BL	622	PAMEX
1	PERIMETER SEAL	797B	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 40 DOOR: 1002 (CLUBHOUSE CORRIDOR)

	2'10" X 6'8" WDD X WDF			
3	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5" BB	631	PAMEX
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	ELECTRIC STRIKE	8300	BLK	HES
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	WALL STOP OR CUSH-N-STOP ARM	DD02-53BL OR GCNSA590-BL (AS REQ'D)	622/693	PAMEX
1	PERIMETER SEAL	797B	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 41 DOOR: 1003 (KEY ROOM)

	2'6" X 6'8" WDD X WDF			
3	BALL BEARING HINGES	H45-02NBL 4.5" X 4.5"	631	PAMEX
		BB NRP		
1	STOREROOM LOCKSET	FYF9SC	622	PAMEX
1	ELECTRIC STRIKE	8300	BLK	HES
1	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
1	FLOOR STOP	DD02-63BL	622	PAMEX
3	SILENCERS	DD02-82	GRY	PAMEX
1	CREDENTIAL READER	BY DIVISION 28		
1	POWER SUPPLY	BY DIVISION 28		

HW SET: 42 DOOR: 1004 (INTERIOR BUSINESS CENTER ENTRY)

	3'0" X 8'0" PAIR WDD/GLS X WDF			
8	BALL BEARING HINGES	H45-02RBL 4.5" X 4.5"	631	PAMEX
		BB		
1	MAG LOCK	1572Y	335	SDC
2	PUSH/PULL COMBO	1738	622	TRIMCO
2	SURFACE CLOSER	GC5900BF-BL	693	PAMEX
2	WALL STOP	DD02-53BL	622	PAMEX
2	PERIMETER SEAL	797B	BLK	REESE
1	CREDENTIAL READER	BY DIVISION 28		
1	REQUEST TO EXIT BUTTON	422C	613	SDC
1	POWER SUPPLY	BY DIVISION 28		

UNITS

HW SET: 43 DOOR: 1 (UNIT ENTRY)

	3'0" X 8'0" HMD X HMF 45 MIN			
4	BALL BEARING HINGES	H44-12RBL 4" X 4" BB	631	PAMEX
1	SINGLE KEYED DEADBOLT	FD791	622	PAMEX
1	PASSAGE LEVERSET	FLT903C X UL LATCH	622	PAMEX
1	DOOR CLOSER	GC8716BF-BL	693	PAMEX
1	SPRING STOP / HINGE PIN STOP	DD02-31BL OR DD02-40BL (AS REQ'D)	622	PAMEX
1	DOOR VIEWER	975U	622	TRIMCO
1	SMOKE SEAL	797B	BLK	REESE
1	DOOR SWEEP	323B	335	REESE

1	THRESHOLD	S225D	710	REESE
HW SET: 44 DOOR: 2 (BALCONY)				
	3'0" X 8'0" PAIR HMD/GLS X HMF			
8	BALL BEARING HINGES	H44-12NBL 4" X 4" BB NRP	631	PAMEX
1	FLUSH BOLT	DD05-60BL	622	PAMEX
1	SINGLE CYLINDER OR ONE SIDED DEADBOLT	FD291 (GROUND) OR FD294 (UPPER)	622	PAMEX
1	PASSAGE LEVERSET	FLT903C	622	PAMEX
2	OVERHEAD STOP	DD08-13S36BL	631	PAMEX
2	WEATHERSTRIPPING	854D	710	REESE
2	DOOR BOTTOM	354D	710	REESE
1	THRESHOLD	S225D	710	REESE
HW SET: 45 DOOR: 3 (WASH ROOM / BEDROOM)				
	2'10" X 6'8" WDD X WDF			
3	PLAIN BEARING HINGES	PRE-HUNG BY DOOR SUPPLIER		
1	PRIVACY LEVERSET	FLT908C	622	PAMEX
1	SPRING STOP / HINGE PIN STOP	DD02-31BL OR DD02-40BL (AS REQ'D)	622	PAMEX
HW SET: 46 DOOR: 3, 4, 8 (LAUNDRY)				
	3'0" X 6'8" WDD X WDF			
	2'10" X 6'8" WDD X WDF			
	2'4" X 6'8" WDD X WDF			
3	PLAIN BEARING HINGES	PRE-HUNG BY DOOR SUPPLIER		
1	PASSAGE LEVERSET	FLT903C	622	PAMEX
1	SPRING STOP / HINGE PIN STOP	DD02-31BL OR DD02-40BL (AS REQ'D)	622	PAMEX
HW SET: 47 DOOR: 5 (MECH ROOM)				
	2'10" X 6'8" WDD X WDF			
3	PLAIN BEARING HINGES	PRE-HUNG BY DOOR SUPPLIER		
1	SINGLE KEYED DEADBOLT	FD291	622	PAMEX
1	SPRING STOP / HINGE PIN STOP	DD02-31BL / DD02-40BL (AS REQ'D)	622	PAMEX
HW SET: 48 DOOR: 6, 7 (DOUBLE CLOSET, DOUBLE LINEN CLOSET)				
	2'6" X 6'8" PAIR WDD X WDF			
	1'6" X 6'8" PAIR WDD X WDF			
6	PLAIN BEARING HINGES	PRE-HUNG BY DOOR SUPPLIER		
2	BALL CATCH	DD05-30BL	622	PAMEX

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2	DUMMY LEVERSET	FLT904	622	PAMEX
2	SPRING STOP / HINGE PIN STOP	DD02-31BL OR DD02-40BL (AS REQ'D)	622	PAMEX

END OF SECTION

SECTION 088000 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for:
 - 1. Windows.
 - 2. Doors.

1.2 CODE COMPLIANCE

- A. Exterior glazing systems shall meet the requirements of the Florida Building Code.
 - 1. Provide product evaluations and installation requirements indicating compliance with Code requirements.

1.3 SUBMITTALS

- A. Product Approval: Submit current Product Approval documentation in accordance with the Florida Building Code.
- B. Product Data: For each glass product and glazing material indicated.
- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Provide product approval or Notice of acceptance when required by code.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

2. Provide where required by code including bath and shower areas, within 18 inches of the floor and within 24 inches of a door jamb.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label.

1.5 WARRANTY

- A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Tinting: As Selected by Owner or Architect from manufacturers full range.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 1. Design Wind Pressures: As indicated on Drawings.

2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated.
 - b. Basic Wind Speed: As indicated.
 - c. Importance Factor: As indicated.
 - d. Exposure Category: As indicated.
- C. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests according to ASTM E 1996 for Wind Zone: As Indicated.
 1. Large-Missile Test: For glazed openings located within 30 feet of grade.
 2. Small-Missile Test: For glazed openings located more than 30 feet above grade.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II where required by Code.
 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. U-Factors: according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 - a. Value as indicated on the drawings.
 5. Solar Heat-Gain Coefficient: according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - a. Value as indicated on the drawings.

2.3 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
- C. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.

2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer or ionomeric polymer interlayer to comply with interlayer manufacturer's written instructions.
 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 3. Interlayer Color: Clear unless otherwise indicated.
- B. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with one of the following to comply with interlayer manufacturer's written instructions:
1. Polyvinyl butyral interlayer.
 2. Ionomeric polymer interlayer.

2.6 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.
- B. Film-Faced Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch nominal thickness; faced on one surface with a clear glazing film; complying with testing requirements in 16 CFR 1201 for Category II materials.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite NT.
 - b. Safti First; SuperLite C/SP.
 - c. Schott North America, Inc.; Filmed Pyran Star.
 - d. Vetrotech Saint-Gobain; SGG Keralite FR-F.

2.7 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
1. Neoprene complying with ASTM C 864.
 2. EPDM complying with ASTM C 864.
 3. Silicone complying with ASTM C 1115.
 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene EPDM silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.
- C. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

3.3 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.

3.4 PROTECTION AND CLEANING

- A. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- B. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.5 GLAZING SCHEDULE

- A. Exterior: 1-inch thick; insulated, clear.
 - 1. Basis of design Product and Manufacturer; Vitro/ PPG SolarBan 70XL (2) Clear + Clear.
 - a. Exterior Lite: Tinted tint, Fully tempered, 1/4-inch thick.
 - b. Air Space: 1/2-inch.
 - c. Interior Lite: Laminated; 1/4-inch heat strengthened, 0.090 PVB interlayer, 1/4-inch thick heat strengthened glass.
 - d. U-factor: As Indicated.
 - e. Solar Heat Gain Coefficient (SHGC): As Indicated.
- B. Interior: 1/4-inch Clear, fully tempered.
- C. Interior Fire Rated: Clear fire rated interior glazing.
 - 1. Basis of Design Manufacturer; SAFTIFIRST.
 - a. Type GL6A - 20 minute rated - SuperLite I
 - b. Type GL6B – 45 minute rated - SuperLite II-XL45
 - c. Type GL6C – 90- minute rated - SuperLite II-XL90
 - d. Type GL6D – 120 minute rated - SuperLite II XL120

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

1. Glass mirrors.

1.2 SUBMITTALS

- A. Product Data: For the following:

1. Silvered mirrored glass. Include description of materials and process used to produce mirrored glass that indicates source of glass, glass coating components, edge sealer, and quality-control provisions.
2. Mirror hardware.

- B. Shop Drawings: Include elevations, sections, details, and attachments to other Work.

- C. Samples for Verification: For the following products, in sizes indicated below:

1. Mirrored glass, 12 inches square, includes edge treatment on 2 adjoining edges.

- D. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed mirrored glass installations similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

- B. NAAMM'S Publication: For silvered mirrored glass, comply with recommendations in NAAMM'S "Mirrors, Handle with Extreme Care, Tips for the Professional on the Care and Handling of Mirrors."

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to mirrored glass manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

- B. For silvered mirrored glass, comply with mirrored glass manufacturer's written instructions for shipping, storing, and handling mirrored glass as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrored glass until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.6 WARRANTY

- A. General Warranty: Special warranty 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. Manufacturer's Special Warranty for Mirrored Glass: Written warranty, made out to Owner and signed by mirrored glass manufacturer agreeing to replace silvered mirrored glass units that deteriorate as defined in "Definitions" Article, f.o.b. to Project site, within specified warranty period indicated below, at no additional cost to the Owner:
 - 1. Warranty Period: Five years from date of manufacture.

PART 2 - PRODUCTS

2.1 FLOAT GLASS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent glass, flat), class, quality, and other properties as indicated below:
 - 1. Clear Annealed Float Glass: Class 1 (clear), Quality q2 (mirror).
 - a. Thickness: 6 mm.

2.2 MIRRORED GLASS

- A. Silvered Mirrored Glass: Annealed, clear float glass with successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard organic protective coating applied to second glass surface to produce a coating system complying with FS DD-M-411.

2.3 FABRICATION

- A. Mirrored Glass Edge Treatment: Treat edges as indicated below.
 - 1. Sanded edge.
 - 2. Seal edges of silvered mirrored glass after edge treatment to prevent chemical or atmospheric penetration of glass coating.
- B. Vinyl-Backed Safety Mirrored Glass: Apply vinyl backing with pressure-sensitive adhesive coating over glass coating as recommended by vinyl-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections. Use adhesives and vinyl backing compatible with mirrored glass as certified by organic coating manufacturer.

2.4 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Neoprene, 70 to 90 Shore A hardness.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirrored glass manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Clip Set:
 - 1. Product and Manufacturer – Basis of Design: E-Z Mirror Clip Set; C.R. Lawrence Co, Inc.
 - a. Provide with non-corrosive fasteners compatible with substrates indicated.
- D. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- E. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates over which mirrored glass units are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.
 - 1. Verify compatibility with and suitability of substrates with existing finishes or primers.
 - 2. Proceed with mirrored glass installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mirror manufacturer's written installation instructions for preparation of substrates.

3.3 GLAZING

- A. General: Install mirrored glass units to comply with written instructions of mirrored glass manufacturer and with referenced GANA and NAAMM publications. Mount mirrored glass accurately in place in a manner that avoids distorting reflected images.
- B. Provide space for air circulation between back of mirrored glass units and face of mounting surface.
- C. For wall-mounted mirrored glass units, install permanent means of support at bottom and top edges with bottom support designed to withstand mirrored glass weight and top support designed to prevent mirrored glass from coming away from wall along top edges.

1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrored glass units.
2. For metal clips, place a felt or plastic pad between mirrored glass and each clip to prevent spalling of mirrored glass edges.

3.4 PROTECTION AND CLEANING

- A. Protect mirrored glass from breakage and contaminating substances resulting from construction operations.
 1. Do not permit edges of silvered mirrored glass to be exposed to standing water.
 2. Maintain environmental conditions that will prevent silvered mirrored glass from being exposed to moisture from condensation or other sources for continuous periods of time.
- B. Wash mirrored glass, so that it can be visually inspected for defects before date scheduled for inspections intended to establish date for Substantial Completion. Wash mirrored glass by methods recommended in NAAMM publication and in writing by mirrored glass manufacturer. Use water and glass cleaners free from substances capable of damaging mirrored glass edges or coatings.

END OF SECTION 088300

SECTION 092116 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Shaft enclosures.
 - 2. Chase enclosures.
 - 3. Stair enclosures.
 - 4. Horizontal enclosures.
- B. Related Sections include the following:
 - 1. Division 9 Section "Gypsum Board Assemblies" for applying and finishing panels in gypsum board shaft-wall assemblies.

1.2 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance:
 - 1. Provide gypsum board shaft-wall assemblies capable of withstanding the full two-thirds of the air-pressure loads indicated for maximum heights of partitions without failing and while maintaining an airtight and smoke-tight seal. Evidence of failure includes deflections exceeding limits indicated, bending stresses causing studs to break or to distort, and end-reaction shear causing track (runners) to bend or to shear and studs to become crippled.
 - 2. Provide gypsum board shaft-wall assemblies for horizontal duct enclosures capable of spanning distances indicated within deflection limits indicated.
 - 3. Air-pressure loads and deflection limits are specified in "Gypsum Board Shaft Wall" Article, articles in Part 2.

1.4 SUBMITTALS

- A. Product Data: For each gypsum board shaft-wall assembly indicated.
- B. Fire-Test-Response Reports: From a qualified independent testing and inspecting agency substantiating each gypsum board shaft-wall assembly's required fire-resistance rating.
 - 1. Include data substantiating that elevator entrances and other items that penetrate each gypsum board shaft-wall assembly do not negate fire-resistance rating.

- C. Research/Evaluation Reports: Evidence of compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction that substantiate required fire-resistance rating for each gypsum board shaft-wall assembly.
- D. Acoustical-Test-Response Reports: From a qualified independent testing agency substantiating required STC rating for each gypsum board shaft-wall assembly.

1.5 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products." UL's "Fire Resistance Directory." GA-600, "Fire Resistance Design Manual." ITS's "Directory of Listed Products."
- B. STC-Rated Assemblies: For gypsum board shaft-wall assemblies indicated to have STC ratings, provide assembly materials and construction complying with requirements of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat on leveled supports off the ground to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Comply with requirements for environmental conditions, room temperatures, and ventilation specified in Division 9 Section, "Gypsum Board Assemblies".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Gypsum Co.
 - 2. G-P Gypsum Corp.
 - 3. National Gypsum Company.
 - 4. United States Gypsum Co.

2.2 ASSEMBLY MATERIALS

- A. General: Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.
 - 1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
 - 2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.
- B. Steel Framing: ASTM C 645.
 - 1. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized coating.
- C. Gypsum Liner Panels: Manufacturer's proprietary liner panels in 1-inch thickness and with moisture-resistant paper faces.
 - 1. Provide moisture resistant panels.
- D. Gypsum Wallboard: ASTM C 36, core type as required by fire-resistance-rated assembly indicated.
 - 1. Edges: Tapered and featured (rounded or beveled) for prefiling.
 - 2. Provide moisture resistant board.
- E. Water-Resistant, Gypsum Backing Board: ASTM C 630/C 630M, core type as required by fire-resistance-rated assembly indicated or if installed prior to building dry-in.
- F. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 9 Section "Gypsum Board Assemblies" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.
- G. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Division 9 Section "Gypsum Board Assemblies."
- H. 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.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- I. Track (Runner) Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
 - 1. Powder-Actuated Fasteners: Provide powder-actuated fasteners with capability to sustain, without failure, a load equal to 10 times that imposed by shaft-wall assemblies, as determined by testing conducted by a qualified independent testing agency according to ASTM E 1190.

- 2. Postinstalled Expansion Anchors: Where indicated, provide expansion anchors with capability to sustain, without failure, a load equal to 5 times that imposed by shaft-wall assemblies, as determined by testing conducted by a qualified independent testing agency according to ASTM E 488.
- J. Acoustical Sealant: As recommended by gypsum board shaft-wall assembly manufacturer for application indicated. As specified in Division 7 Section "Joint Sealants." As specified in Division 9 Section "Gypsum Veneer Plaster." As specified in Division 9 Section "Gypsum Board Assemblies."
- K. Sound Attenuation Blankets: ASTM C 665 for Type I, unfaced mineral-fiber-blanket insulation produced by combining thermosetting resins with mineral fibers manufactured from slag or rock wool.

2.3 GYPSUM BOARD SHAFT WALL

- A. Basis-of-Design Product: As indicated on Drawings by design designation of a qualified testing and inspecting agency.
- B. Intermittent Sustained Air-Pressure Loads: 5 lbf/sq. ft. (0.24 kPa), 7.5 lbf/sq. ft. (0.36 kPa), 10 lbf/sq. ft. (0.48 kPa), 15 lbf/sq. ft. (0.72 kPa)
- C. Deflection Limit: L/240, L/360.
- D. Studs: Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated: 2-1/2 inches Minimum, 4 inches, 6 inches.
 - 2. Minimum Base Metal Thickness: Manufacturer's standard thicknesses that comply with structural performance requirements for stud depth indicated.
- E. Track (Runner): Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 –1/2 inches, in depth matching studs.
 - 1. Minimum Base Metal Thickness: Manufacturer's standard thicknesses that comply with structural performance requirements for stud depth indicated.
- F. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches, in depth matching studs, and not less than 0.0341 inch thick.
- G. Room-Side Finish: Gypsum board.
- H. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.
- I. STC Rating: As indicated.
- J. Cavity Insulation: Sound attenuation blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway, doorframes, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum shaft-wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft-wall assemblies to comply with requirements specified in Division 7 Section "Sprayed Fire-Resistive Materials."
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

- A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:
 - 1. ASTM C 754 for installing steel framing.
 - 2. Division 9 Section "Gypsum Board Assemblies" for applying and finishing panels.
- B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.
 - 1. At elevator hoistway doorframes, provide jamb struts on each side of doorframe.
 - 2. Where handrails directly attach to gypsum board shaft-wall assemblies, provide galvanized steel reinforcing strip with 0.0312-inch minimum thickness of base (uncoated) metal, accurately positioned and secured behind at least 1 face-layer panel.
- D. Integrate stair hanger rods with gypsum board shaft-wall assemblies by locating cavity of assemblies where required to enclose rods.

- E. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- F. Isolate gypsum finish panels from building structure to prevent cracking of finish panels while maintaining continuity of fire-rated construction.
- G. Install control joints to maintain fire-resistance rating of assemblies.
- H. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C 919, whichever is more stringent.
- I. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 2 inches of the shaft face of structural beams, floor edges, and similar projections into shaft, install 1/2- or 5/8-inch- thick, gypsum board cants covering tops of projections.
 - 1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft-wall framing.
 - 2. Where steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to the shaft-wall framing.

END OF SECTION 092116

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 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.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested according to ASTM E 119.
- B. 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.
- C. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Interior Wall Framing: Horizontal deflection of L/240 of the wall height under a horizontal load of 5 lbf/sq. ft.

2.2 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- 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, G60, hot-dip galvanized.

3. Depth: As indicated on Drawings.
4. Minimum Base-Metal Thickness: 0.0188 inch (25 gauge), except as indicated below.
 - a. Provide 3-5/8-inch, 20 DW gauge metal studs at 16 inches on center for walls between 10 to 12 feet in height.
 - b. Provide 3-5/8-inch, 20 STR gauge metal studs at 16 inches on center for walls between 12 to 16 feet in height.
 - c. Provide 0.0312-inch thick studs for framing supporting ceramic tile substrates.
- B. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
 1. Depth: As indicated on Drawings.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 1. Depth: As indicated on Drawings.
- D. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
 1. Configuration: Asymmetrical or hat shaped.
- E. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
 1. Depth: As indicated on Drawings.
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.
 3. 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.
- F. Z-Shaped Furring: With slotted or nonslotted web, face flange of Insert depth, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-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.
 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, 0.162-inch diameter.
- D. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
 - 2. Steel Studs: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0179 inch.
 - b. Depth: As indicated on Drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base Metal Thickness: 0.0312 inch.
- E. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

- A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
 - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
 - 3. Gypsum 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.

3.2 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 and other assembly components 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. Stud Spacing: 16-inches on center unless otherwise indicated.
- E. 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.

F. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

G. Z-Furring Members:

1. Erect 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.

H. 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.

3.3 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.

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, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
3. Do not attach hangers to steel roof deck.
4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. 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 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum board.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples of textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.
- C. Submit Fire-Resistance-Rated Assemblies indicating all materials and construction identical to those tested in the U.L. approved assembly indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 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 Corp.
 3. Georgia-Pacific Gypsum LLC.
 4. Lafarge North America Inc.
 5. National Gypsum Company.
 6. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 1. Thickness: 1/2 inch.
 2. Long Edges: Tapered.

- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- D. Flexible Gypsum Board: ASTM C1396/C1396M. 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.
- E. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.
- F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Thickness: As indicated.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.3 EXTERIOR GYPSUM BOARD

- A. Exterior Gypsum Soffit Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
 - 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. American Gypsum.
 - b. CertainTeed Corp.
 - c. Georgia-Pacific Gypsum LLC.
 - d. Lafarge North America Inc.
 - e. National Gypsum Company.
 - f. USG Corporation.
 - 2. Core: 5/8-inch min.

2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
 - 1. Core: As indicated on Drawings.
 - 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use 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 drying-type, all-purpose compound.
- D. Joint Compound for Exterior Applications:
 1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
- E. Joint Compound for Tile Backing Panels:
 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.7 AUXILIARY MATERIALS

- A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing).
- D. Acoustical Joint Sealant: Refer to Section 079200 "Joint Sealants."
- E. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

2.8 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
- B. Textured Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; ProRoc Wall and Ceiling Spray Texture.
 - b. Georgia-Pacific Gypsum LLC; ToughRock Ceiling Textures/Vermiculite.
 - c. USG Corporation; SHEETROCK Wall and Ceiling Spray Texture (Aggregated).
 - 2. Wall texture: Orange Peel.
 - 3. Ceilings: Orange Peel.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

- A. Comply with ASTM C 840.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. 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.
- D. Install 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.
 - 1. Aluminum Trim: Install in locations indicated on Drawings.
 - 2. Control Joints: Install control joints at locations indicated on Drawings.
- E. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- F. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 3: Concealed Locations.
 - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

3. Level 5: At all amenity areas including the clubhouse.

- G. Texture Finish Application: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.
- H. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- I. Remove and replace panels that are wet, moisture damaged, and mold damaged.

3.2 INSTALLING RESILIENT CHANNELS

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- B. Direct Furring:
 - 1. Screw to wood framing.
- C. 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.

END OF SECTION 092900

SECTION 093000 – TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Tile.
 - 2. Thresholds
 - 3. Window sills.
 - 4. Waterproof Membrane for tile installation.
 - 5. Rubber tile accessories for bathtubs.

1.2 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ANSI A137.1:
 - 1. Level Surfaces: Minimum 0.6.
 - 2. Step Treads: Minimum 0.6.
 - 3. Ramp Surfaces: Minimum 0.8.
 - 4. Accessible Routes: 0.6 wet.
 - 5. Commercial spaces that will be regularly walked on when wet: 0.42.
- B. Load-Bearing Performance: For ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project.

1.3 SUBMITTALS

- A. Product Data: For each type of tile, mortar, grout, and other products indicated.
- B. TCNA installation numbers for each tile application.
- C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- D. Samples: Of each item listed below, where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
 - 1. Full-size units of each type of trim and accessory for each color required.
 - 2. Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.
 - 3. Stone thresholds in 6-inch lengths.
 - 4. Metal edge strips in 6-inch lengths.
- E. Tile Test Reports: Indicate and interpret test results for compliance of slip resistant tile.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.2 THRESHOLDS AND WINDOW SILLS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel threshold edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds and window sills: ASTM C 503.
 - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.
 - 2. Description: Match Architect's sample.
 - 3. Finish: As Selected by Architect from manufacturer's full range.

2.3 TILE PRODUCTS

- A. Wall and Floor Tile: Basis of Design Product and Manufacturer; as indicated on the Unit Finish Schedule.

2.4 WATERPROOFING AND CRACK SUPPRESSION MEMBRANE

- A. Thin Set Applications

1. Basis-of-Design Product: Subject to compliance with requirements, provide Custom Building Products; RedGard Waterproofing and Crack Prevention Membrane or a comparable product by one of the following:

- a. Bostik, Inc.
- b. LATICRETE SUPERCAP, LLC.
- c. MAPEI Corporation.

B. Thick Set Applications

1. "Chloraloy 240" chlorinated polyethylene (CPE) shower pan membrane by The Noble Company, or "Kerdi-Drain" by Schluter Systems.
2. Membrane shall comply with ASTM D 4068.
3. Waterproof membrane shall be installed on sloped mortar to provide minimum slope to drains as required by the manufacturer's written installation instructions.

2.5 SETTING MATERIALS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide MAPEI Corporation; or a comparable product by one of the following:

1. Bostik, Inc.
2. Custom Building Products.
3. LATICRETE SUPERCAP, LLC.

- B. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

- C. Modified Dry-Set Mortar (Thinset): ANSI A118.4 and 118.11..

1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.6 GROUT MATERIALS

- A. Walls and Floors in Apartment Units: High-Performance Sanded cement Tile Grout: ANSI A118.7.

- B. Walls in common areas: High-Performance Sanded cement Tile Grout: ANSI A118.7.

- C. Floors in Common areas, and Floors and Walls in Pet Spa: Water-Cleanable Epoxy Grout: ANSI A118.3.

2.7 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 "Joint Sealants."

- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

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

- a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
- b. Dow Corning Corporation; Dow Corning 786.
- c. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
- d. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
- e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
- f. Tremco Incorporated; Tremsil 600 White.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

- B. Metal Edge Strips: White-zinc-alloy terrazzo strips, 1/8 inch wide at top edge with integral provision for anchorage to mortar bed or substrate, for use when tile abuts dissimilar floor coverings unless noted otherwise.

- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

- D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

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

- a. Bonsal American; an Oldcastle company; Grout Sealer.
- b. Bostik, Inc.; CeramaSeal Siloxane 220.
- c. C-Cure; Penetrating Sealer 978.
- d. Custom Building Products; Surfaceguard Sealer.
- e. Jamo Inc.; Matte Finish Sealer.
- f. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.

- E. Rubber starter accessories for tile at bathtubs.

- 1. Basis of Design Product and Manufacturer; Johnsonite model TN-50-A.

2.9 MIXING MORTARS AND GROUTS

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers written instructions.

- B. Add materials, water, and additives on accurate proportions.

- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
 - 2. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
 - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Joint Widths: Install tile on floors with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch.

2. Bath Floor Tile: 1/4 inch.
 3. Other Floor Tile: 3/8 inch U.N.O.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
- I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- 3.4 WATERPROOFING INSTALLATION
- A. Install waterproofing to comply with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout haze and smears from tile according to manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
 - 3. Protection: Protect installed product and finish surfaces from damage during construction.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure tile is without damage or deterioration at the time of Substantial Completion.

3.6 INSTALLATION OF GROUT SEALER

- A. Comply with manufacturer's current printed instructions. Grout joints shall be cleaned thoroughly to remove all surface soil and stains.
- B. Grout joints shall be cured prior to sealing. Apply grout sealer full strength to grout joints with a brush, cloth or sprayer. Remove excess sealer and buff to a gloss.

END OF SECTION 093000

SECTION 096540 – VINYL PLANK FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Solid vinyl plank flooring.
 - 2. Rubber tile accessories for bathtubs.

1.2 SUBMITTALS

- A. Product Data: For each type of product
- B. Shop Drawings: For each type of floor plank. Include floor plank layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples: Full-size units of each color and pattern of floor plank required.

1.3 WARRANTY

- A. Manufacturer's Standard warranty to begin at date of Substantial Completion.

PART 2 - PRODUCTS

2.1 VINYL PLANK FLOORING

- A. General: Vinyl plank flooring; consisting of a tough, clear unfilled, poly-urethane coated thick wear layer composed of poly-vinyl Chloride resins, plasticizers, stabilizers; over a printed film on an intermediate layer over a filled vinyl backing. Flooring shall meet composition, size, thickness, squareness, flexibility, residual indentation, resistance to chemicals, resistance to heat and resistance to light requirements of ASTM F 1700, "Standard Specification for Solid Vinyl Tile," Class III, Type B – Embossed Surface.
 - 1. Basis of Design Manufacturer; Shaw Floors, Subject to compliance with requirements, other available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong.
 - b. Burke Flooring.
 - c. Roppe.
 - 2. Thickness: .125 inches
 - 3. Wearing Surface: As selected by Architect from Manufacturer's full range of textures.
 - 4. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor plank manufacturer for applications indicated.
- B. Rubber starter accessories for tile at bathtubs.
 - 1. Basis of Design Product and Manufacturer; Johnsonite model TN-50-A.
- C. Adhesives: Water-resistant type recommended by floor plank and adhesive manufacturers to suit floor plank and substrate conditions indicated.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor plank manufacturer.

PART 3 - EXECUTION

- A. Prepare substrates according to floor plank manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor plank manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor plank manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor plank manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor planks until they are the same temperature as the space where they are to be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor plank.

3.2 FLOOR PLANK INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor plank.

- B. Lay out floor planks from center marks established with principal walls, discounting minor offsets, so planks at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half plank at perimeter.
 - 1. Lay planks in pattern indicated.
- C. Match floor planks for color and pattern by selecting planks from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed planks.
 - 1. Lay planks in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor planks to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor planks into toe spaces, door reveals, closets, and similar openings. Extend floor planks to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor planks as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor planks on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of plank installed on covers and adjoining planks. Tightly adhere plank edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor planks to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor plank.
- B. Floor Polish: Remove soil, adhesive, and blemishes from floor plank surfaces before applying liquid floor polish in accordance with manufacturer's recommendations.

END OF SECTION 096540

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Carpet tile, and walk-off carpets.

1.2 SUBMITTALS

- A. Product Data: Submit product data for each carpet material and installation accessory required. Submit written data on physical characteristics, durability, resistance to fading, and flame resistance characteristics.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 1. Carpet Tile: Full-size Sample.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.4 PROJECT CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Comply with manufacturer's requirements for temperature and humidity.
- C. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- D. Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- E. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.5 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, lifetime stain resistance, lifetime abrasive wear, lifetime colorfastness to light and delamination.

- 1. Warranty Period: Lifetime of the carpet.

PART 2 - PRODUCTS

2.1 CARPET TILE AND WALK-OFF CARPETS

- A. Product and Manufacture: Refer to the Interior Design Documents.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- 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 that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations for carpet installation.
- B. Maintain dye lot integrity. Do not mix dye lots in same area.
- C. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- D. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- F. Install pattern parallel to walls and borders.
- G. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104 "Protection of Indoor Installations."

- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 096816 - SHEET CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes carpet and carpet cushion.

1.2 PREINSTALLATION MEETINGS

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

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - 2. Carpet type, color, and dye lot.
 - 3. Seam locations, types, and methods.
 - 4. Pile direction.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Product test reports.
- E. Warranty: Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Warranty for Carpet Cushion: Manufacturer agrees to repair or replace components of carpet cushion installation that fail in materials or workmanship within specified warranty period.

1. Warranty includes consequent removal and replacement of carpet and accessories.
2. Warranty does not include deterioration or failure of carpet cushion due to unusual traffic, failure of substrate, vandalism, or abuse.
3. Failure includes, but is not limited to, permanent indentation or compression.
4. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET

- A. Products: Refer to Interior Design Documents

2.2 CARPET CUSHION

- A. Products: Refer to Interior Design Documents

2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.
- C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.
- D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Preparation: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.

- E. Installation: Comply with CRI 104 and carpet and carpet cushion manufacturers' written installation instructions for the following:
 - 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
 - 2. Double-Glue-Down Installation: Comply with CRI 104, Section 10, "Double-Glue-Down Installation."
 - 3. Carpet with Attached-Cushion Installation: Comply with CRI 104, Section 11, "Attached-Cushion Installations."
 - 4. Preapplied Adhesive Installation: Comply with CRI 104, Section 11.4, "Pre-Applied Adhesive Systems (Peel and Stick)."
 - 5. Hook-and-Loop Installation: Comply with CRI 104, Section 11.5, "Hook and Loop Technology."
 - 6. Stretch-in Installation: Comply with CRI 104, Section 12, "Stretch-in Installations."
 - 7. Stair Installation: Comply with CRI 104, Section 13, "Carpet on Stairs" for glue-down installation.
- F. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
- G. Do not bridge building expansion joints with carpet.
- H. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- I. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- J. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- K. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.
- L. Comply with carpet cushion manufacturer's written recommendations. Install carpet cushion seams at 90-degree angle with carpet seams.
- M. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- N. Protect installed carpet to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 096816

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed exterior items and surfaces.
 - 2. Exposed interior items and surfaces.
 - 3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment and application of paint coats to all finish coated mechanical and electrical equipment in exterior locations, except as otherwise indicated.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
- D. Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.2 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 - 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
- B. Samples for Verification: Of each color and material to be applied, with texture (if applicable) to simulate actual conditions.
 - 1. Provide Samples, on block fillers and/ or primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.

1.3 QUALITY ASSURANCE

- A. **Applicator Qualifications:** Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. **Source Limitations:** Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. **Mockups:** Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. **Vertical and Horizontal Surfaces:** Provide samples of at least 100 sq. ft.
 - b. **Other Items:** Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

- A. **General:** Naming of manufacturers and model numbers is to indicate type and quality of items required and is not intended to limit competition. Paints produced by other listed manufacturers, that meet or exceed the properties of the specified products may be proposed for use on this project.

- B. Manufacturers Specified:
 - 1. Paint: Sherwin-Williams
 - 2. Stain: Minwax
 - 3. Concrete Sealer: Glidden Professional

- C. Other Acceptable Manufacturers:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Finishes, Inc.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: As selected by Architect from manufacturer's full range.

2.3 INTERIOR PAINT SCHEDULE

- A. Gypsum Drywall.
 - 1. Paint system application: Latex; two finish coats over primer.
 - a. Primer: Sherwin Williams, Preprime 200 Interior Acrylic Latex Primer.
 - b. Finish Coats: Sherwin Williams, Promar 200 Interior Acrylic Latex.
 - c. Sheen: Egg-shell.
- B. Wood Trim.
 - 1. Paint system application: Latex; two finish coats over primer.
 - a. Primer: Sherwin Williams, Preprime 200 Acrylic Latex Primer.
 - b. Finish Coats: Sherwin Williams, Promar 200 Interior Acrylic Latex.
 - c. Sheen: Semi-gloss.
- C. Concrete Floors (Sealer):
 - 1. Type and Application: Acrylic, clear; two coats over prepared substrate.

- a. Finish Coats: Groundworks 3214, Water-Based Clear Acrylic Concrete Sealer; Glidden Professional

2.4 EXTERIOR PAINT SCHEDULE

- A. Fiber Cement, Wood, Stucco, Masonry and Concrete.
 - 1. Paint system application: Latex; two finish coats over primer.
 - a. Primer: Sherwin Williams, Loxon Conditioner or Loxon Concrete & Masonry Primer
 - b. Finish: Sherwin Williams, A100 Exterior Latex.
 - c. Sheen Level: Egg-shell.
- B. Ferrous Metal – Primed and Unprimed:
 - 1. Pre-primed requires top finish only; prime coat damaged surfaces.
 - a. Primer: (1) coat - Kem Kromik Universal Primer.
 - b. Finish Coats: (2) coats - Pro Industrial, Industrial Enamel 100.
 - c. Sheen Level: Semi-gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Portland Cement Plaster: 12 percent.
 - 5. Gypsum Board: 12 percent.
- C. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. 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.
 - 2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Doors: Paint all surfaces of doors including tops and bottoms and sides of exterior and interior doors. Paint tops and bottoms and sides of doors using the same coating system specified for face surfaces.
- C. 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.
- D. Cut-in trim and projections at all areas receiving direct access by occupants; including amenity buildings, club house; mail facility and primary building entrances into the Apartment Buildings.

3.4 CLEANING

- A. 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.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION 099100

SECTION 101423 – PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Installation of Building and Interior Signage.
 - 2. Design criteria to comply with The Fair Housing Act, The Florida Building Code, and The American's with Disabilities Act.

1.2 SUBMITTALS

- A. Product Data: Submit details of construction relative to materials, dimensions of individual components, profiles, finishes and mounting.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the signage manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain signage through one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- A. Material as specified in the interior design and landscape packages.
- B. Provide signage that complies with the Americans with Disabilities Act (ADA), International Building Code and the Fair Housing Act (FHA).
 - 1. Tactile Letters: Raised a minimum of 1/32 inches.
 - a. High Contrast Lettering.
 - b. Letter Height: Between 5/8 inch to 2 inches.
 - c. Provide braille in non-residential areas.
 - 2. Units:
 - a. Letters: 5/16 inch to 2 inches high and raised 1/32 inch.
 - b. Braille: Not required.
 - c. Font: Sanisurf.
 - d. Provide high contrast of color between letters and background.
 - 3. Ancillary Buildings:
 - a. Letters: 5/16 inch to 2 inches high raised 1/32 inch.
 - b. Braille: Grade 2.

- c. Font: Sanisurf.
- d. Provide high contrast of color between letters and background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine wall surfaces, with the Installer present, for compliance with requirements and other conditions affecting installation of signage.
 - 1. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install units plumb and level, in locations and with mountings as required by manufacturer. Securely attach to supporting structure with concealed fasteners, according to manufacturer's written installation instructions.
- B. Install signage to comply with ADA for heights and locations. Do not install on doors.
 - 1. 5'-0" above finished floor to center line of sign adjacent to strike jamb.
 - 2. Locate adjacent to door handle.

3.3 CLEANING AND PROTECTING

- A. At completion of installation, clean surfaces according to manufacturer's written instructions.

END OF SECTION 101423

SECTION 102113 - PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad toilet compartments configured as toilet enclosures and urinal screens.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachment details.
- C. Samples for each type of toilet compartment material indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for toilet compartments designated as accessible.

2.2 PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Accurate Partitions Corp.; ASI Group; or a comparable product by one of the following:
 1. Bradley Corporation.
 2. General Partitions Mfg. Corp.
 3. Scranton Products.
- B. Toilet-Enclosure Style: Overhead braced Floor anchored.
- C. Urinal-Screen Style: Wall hung Post to ceiling.

- D. Door, Panel, and Pilaster Construction: One-piece, plastic-laminate facing sheets pressure laminated to core material without splices or joints in facings or cores; with laminate applied to edges before faces to seal edges and prevent laminate from being pried loose. Seal exposed core material at cutouts to protect core from moisture.
 - 1. Core Material: Particleboard.
 - 2. Doors and Panels: Finished to not less than 7/8 inch thick.
 - 3. Pilasters: Provide construction to comply with the following:
 - a. Finished to not less than 1-1/4 inches thick.
- E. Pilaster Shoes: Formed from stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
- F. Urinal-Screen Post: Manufacturer's standard post design of 1-3/4-inch-square, aluminum tube with satin finish; with shoe and sleeve (cap) matching that on the pilaster.
- G. Brackets (Fittings):
 - 1. Stirrup Type: Ear or U-brackets, chrome-plated zamac.
- H. Plastic-Laminate Finish: One color and pattern in each room.
 - 1. Color and Pattern: As selected by Architect from manufacturer's full range.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
 - 1. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.4 MATERIALS

- A. Particleboard: ANSI A208.1, Grade M-2.
- B. Plastic Laminate: NEMA LD 3, general-purpose HGS grade, 0.048-inch nominal thickness.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- E. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102215 - CHAIN LINK PARTITIONS AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Chain-link Partitions.
 - 2. Swing Gates.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Chain-link fence framework shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified and on the following:
 - a. Fence Height: As indicated on the Drawings.
 - b. Material Group: IA, ASTM F 1043, Schedule 40 steel pipe.

1.3 SUBMITTALS

- A. Product Data: For fence type indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences.
 - 1. Fence posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard form in which agrees to repair or replace components of chain-link fences that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE AND GATE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:
1. Fabric Height: As indicated on Drawings.
 2. Steel Wire Fabric: Wire with a diameter of 0.148 inch.
 - a. Mesh Size: 1-1/4 inches.
 - b. Zinc-Coated Fabric: ASTM A392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied after weaving.
 3. Selvage: Knuckled at both selvages.

2.2 FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:
1. Fence Height: As indicated on Drawings.
 2. Industrial Strength: Material Group IA, round steel pipe, Schedule 40.
 - a. Line Post:
 - 1) For Fence Height up to and including 6-feet: 1.9 inches O.D.
 - b. End, Corner and Pull Post:
 - 1) For Fence Height up to and including 6-feet: 2.375 inches O.D.
 3. Horizontal Framework Members: Intermediate, top, and bottom rails complying with ASTM F 1043.
 - a. Top Rail: 1.66 inches in diameter.
 4. Metallic Coating for Steel Framing:
 - a. Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123 or 4.0-oz./sq. ft. zinc coating per ASTM A 653.
 5. Coatings: Any coating above.

2.3 GATES

- A. General: ASTM F 900 for gate posts and single swing gate types.
1. Gate Leaf Width: 36 inches.

2. Framework Member Sizes and Strength: Based on gate fabric height of more than 72 inches.
- B. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.
- C. Frame Corner Construction: Welded.
- D. Frames and Bracing: Fabricate members from galvanized steel tubing with outside dimension and weight according to ASTM F 900 for the following gate fabric height:
 1. Gate Fabric Height: As indicated.
- E. Hardware:
 1. Hinges: 180-degree outward swing.
 2. Latch: Permitting operation from both sides of gate.
 3. Welded steel plates for hardware to accommodate latching device and locking hasp.

2.4 FITTINGS

- A. General: Comply with ASTM F 626.
- B. Post Caps: Provide for each post.
- C. Rail and Brace Ends: For each corner, pull, and end post.
- D. Rail Fittings: Provide the following:
 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate rails in the fence line-to-line posts.
- E. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- F. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
 - a. Hot-Dip Galvanized Steel: 0.106-inch-diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- G. Finish:
 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.

3.3 CHAIN-LINK FENCE INSTALLATION

- A. Post Setting: Set posts as indicated and spaced as indicated.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting.
- B. Terminal Posts: Locate terminal end and corner posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment as indicated on Drawings.
- C. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- D. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, and attach to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- E. Intermediate and Bottom Rails: Install and secure to posts with fittings.
- F. Chain-Link Fabric: Apply fabric to enclosing framework. Leave 1 inch between floor and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- G. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 - 1. Maximum Spacing: Tie fabric to line posts at 12 inches on center and to braces at 24 inches on center

- H. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.4 GATE INSTALLATION

- A. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- B. Adjust gates to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches engage accurately and securely without forcing or binding.
 - 1. Lubricate hardware and other moving parts.

END OF SECTION 102215

SECTION 102813 – COMMERCIAL TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Commercial toilet accessories.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, and finishes for each accessory specified.
- B. Samples for initial selection: For each exposed product and for each finish specified, full size.
- C. Samples for verification: For each exposed product and for each finish specified, full size.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- D. Setting Drawings: For installing anchoring devices.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.5 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Manufacturers Standard Warranty

PART 2 - PRODUCTS

2.1 TOILET ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Bradley Washroom Equipment, Inc.

1. Finish for all accessories: As selected by Architect from Manufacturers full range.
 - a. Toilet Tissue Dispenser – Model 5A10.
 - b. Typical Mirror Unit – Model 781.
 - 1) Size as Indicated on drawings.
 - c. ADA Mirror Unit – Model 740.
 - 1) Size As indicated on drawings.
 - d. Combination Towel Dispenser waster receptacle – Model 2496 – Model 2A25.
 - e. Grab Bars – Model 812.
 - 1) Size 36 and 42 inches refer to plans for locations.
 - f. Deck Mounted Soap Dispenser – Model 6324.
 - g. Robe Hooks – Model 9119
 - 1) Mount at 48 inches AFF at toilet compartments.
 - h. Sanitary Napkin Disposal Unit – Model 4A10.

2.2 CUSTODIAL ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Bradley Washroom Equipment, Inc.
1. Finish: Satin Stainless
 - a. Utility Shelf/ Mop and Broom holder – Model 9933

2.3 UNDERLAVATORY GUARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Plumberex Specialty Products, Inc.
 2. Truebro by IPS Corporation.

- B. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
- C. Material and Finish: Antimicrobial, molded plastic, white.

2.4 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- C. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.5 FABRICATION

- A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
- C. Remove temporary labels and protective coatings.
- D. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102813

SECTION 102816 – RESIDENTIAL BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Residential bath accessories.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, and finishes for each accessory specified.
- B. Samples for initial selection: For each exposed product and for each finish specified, full size.
- C. Samples for verification: For each exposed product and for each finish specified, full size.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- D. Setting Drawings: For installing anchoring devices.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.5 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Manufacturers Standard Warranty

PART 2 - PRODUCTS

2.1 BATH ACCESSORIES

- 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:
 - a. Basco, Inc.
 - b. Franklin Brass by Liberty Hardware Manufacturing Corporation; a Masco company.
 - c. Ginger by Brasstech, Inc.; a Masco company.
 - d. Seachrome Corporation.
 - e. Tubular Specialties Manufacturing, Inc.
- 2. Finish for all accessories: As selected by Architect from Manufacturers full range.
 - a. Towel Bar:
 - 1) Length as Indicated.
 - b. Towel Ring
 - c. Toilet Tissue Dispenser
 - d. Shower Curtain Rod
 - 1) Mounting: Flanges with concealed fasteners.
 - 2) Shape: Radiused.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- C. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.3 FABRICATION

- A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
- C. Remove temporary labels and protective coatings.
- D. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102816

SECTION 102819 -SHOWER ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes shower enclosures.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For shower doors and enclosures.
- C. Samples: For each type of exposed finish.

1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of tub and shower doors and enclosures that fail in materials or workmanship within specified warranty period without monetary limitation.
 - 1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHOWER ENCLOSURES

- A. Frameless glass panels with mounting and operating hardware of types and sizes required to support imposed loads.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Shower Door.
 - b. Artistcraft Shower Doors.
 - c. Basco Corporation.
 - d. Cardinal Shower Enclosures; Hoskin & Muir, Inc.
 - e. Century Bathworks.
 - f. Kohler Co.
 - g. Southeastern Aluminum Products, Inc.
 - 2. Shape and Configuration: As Indicated.
- B. Hardware and Trim: Manufacturer's standard units as indicated and as required for complete installation.

- C. Materials: Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Finish: Clear anodic.
- D. Sheet and Plate: ASTM B 209 (ASTM B 209M).
- E. Extrusions: ASTM B 221 (ASTM B 221M).
- F. Swinging Doors: Hinged for double acting swing inward and outward. Soft bulb seal or wipes; affixed to door to direct water back into enclosure and provide a tight water seal.
 - 1. Hinges: Side hinged.
 - 2. Door Pulls: Back-to-back towel bars.
 - a. Towel Bar Length: 24 inches.
- G. Fixed Panels: Side mounts; match hinges in material and finish.
- H. Glazing: Safety glazing materials complying with 16 CFR 1201, Category II, with permanently etched identification acceptable to authorities having jurisdiction.
 - 1. Glass Thickness: ½" thick.
- I. Fasteners: Manufacturer's standard stainless-steel or other noncorrosive fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare and install as recommended in manufacturer's written instructions unless more stringent requirements are contained in GANA's "Glazing Manual."

END OF SECTION 102819

SECTION 104413 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Fire extinguishers.
 - 2. Fire extinguisher cabinets.

1.2 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for cabinets include dimensions, details showing mounting methods, and materials.
- C. Samples for initial selection purposes in the form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of cabinet finish indicated or exposed to view.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.
- B. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated.
- C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:
 - 1. Badger Fire Extinguishers.
 - 2. Buckeye Fire.
 - 3. Kidde
 - 4. Larsen's Manufacturing Co.

2.2 FIRE EXTINGUISHERS

- A. Multipurpose Dry Chemical Type: UL-rated 2-A:10-B:C, 5-lb, in enameled steel container apartment units.

2.3 MOUNTING BRACKETS

- A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.
 - 1. Provide brackets for extinguishers not located in cabinets.
 - a. Non-public areas.
 - b. Apartment units.

2.4 CABINETS

- A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
- B. Fire-Rated Cabinets: UL listed with UL listing mark equivalent to the fire-resistance rating equal to the wall where it is installed.
- C. Cabinet Type: Suitable for containing the following:
 - 1. Fire extinguisher.
- D. Cabinet Mounting: Suitable for the following mounting conditions:
 - 1. Semi-recessed.
- E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
- F. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.
 - 1. Application Process: Silk screen.
- G. Door Style: Manufacturer's standard design.
 - 1. Half-Glass Panel: Tempered glass, 1/8 inch thick.
 - 2. Provide keyed cylinder lock.
- H. Location:
 - 1. In public areas, common areas and amenity buildings.
 - 2. Breezeways in apartment buildings.

2.5 CABINET FINISHES

- A. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two-coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.
 - 1. Color and Gloss: As selected by Architect or interior designer from manufacturer's standard choices for color and gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine rough-in for hose vales, hose racks, and cabinets to verify locations of piping connections prior to cabinet installation.
- B. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Follow manufacturer's printed instructions for installation.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities and the American with Disabilities Act.
 - 1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 2. Fasten mounting brackets and cabinets to structure, square and plumb.
 - 3. Projections of cabinet into space cannot exceed 4 inches as required by the Fair Housing Act, "The American with Disabilities Act" and The Florida Building Code.

END OF SECTION 104413

SECTION 105500 - POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Mailboxes.
 - 2. Automated Parcel Locker equipment

1.2 SUBMITTALS

- A. Product Data: For products indicated.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of postal specialty.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include identification sequence for compartments.
 - 3. Include layout of identification text.
 - 4. Include setting drawings, templates, and installation instructions for anchor bolts and other anchorages installed as part of the Work of other Sections.
- C. Samples for Verification: For exposed finish, prepared on 6-by-6-inch square Samples.
- D. Product Certificates: For postal specialty required to comply with USPS regulations, signed by product manufacturer. Include written approval by Postmaster General.
- E. Sample Warranty: For warranty.
- F. Maintenance Data: For postal specialties and finishes to include in maintenance manuals.

1.3 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. Key Blanks: Provide 10 key blanks for each type of compartment-door lock installed.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Furnish lock keys according to USPS requirements; with temporary identification for their respective locks, bagged, and securely taped inside the collection compartment for shipping.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within specified warranty period.
- B. Failures include, but are not limited to, the following:
 - 1. Structural failures.
 - 2. Faulty operation of hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MAILBOXES

- A. Model and Manufacturer – Basis of Design: Model 4C Units; Auth-Florence Manufacturing, a Florence company.
 - 1. Configuration: As Indicated.
 - 2. Color and Finish: Match Architects Sample.

2.2 AUTOMATED PARCEL LOCKER EQUIPMENT

- A. Consisting of a control module and one or more locker columns. Each locker module consists of multiple individual lockers controlled by electronic locking system engaged or released by the control module. The System shall consist of the number of locker modules as indicated and kiosk control module.
- B. Basis of design Manufacturer; Package Concierge PC7-54 System.
- C. Locker System Base Materials:
 - 1. Steel (ASTM A1008 CS Type B)
- D. Locker System Exterior Finish: Match Architects Sample.

2.3 ACCESSORIES

- A. Directory for Mail Receptacles: Surface-mounted, front-opening unit, with clear glass or plastic window.
- B. Key Cabinet: Wall-mounted, steel cabinet with pivoting, key-holding panels and side-hinged door equipped with five-pin tumbler, cylinder-door lock and concealed, full-length flush hinge. Finish cabinet, panels, and door with baked-enamel or powder-coated finish. Key-control system consisting of key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers.
- C. Capacity: Keys for 150 percent of the number of mail-receptacle locks.

- D. Cross-Index System: Consisting of index cards for recording key information. Include three receipt forms for each key-holding hook.
Baked-Enamel or Powder-Coated Finish: Color as indicated.

2.4 CONNECTION FOR PARCEL LOCKER EQUIPMENT

- A. The system requires electrical and Ethernet connection (CAT 5e compatible) both located within 5ft of the control module to operate the locker system. Coordinate power requirements with system manufacturer.

2.5 FABRICATION

- A. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs and safe to touch. Fabricate doors of postal specialties to preclude binding, warping, or misalignment.
- B. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly.
- C. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.
- D. Drill or punch holes required for fasteners and remove burrs. Use security fasteners where fasteners are exposed. If used, seal external rivets before finishing.
- E. Weld in concealed locations to greatest extent possible without distorting or discoloring exposed surfaces. Remove weld spatter and welding oxides from exposed surfaces.
- F. Fabricate tubular and channel frame assemblies with manufacturer's standard welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support loads.
- G. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturers of dissimilar metals.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for roughing-in openings, clearances, and other conditions affecting performance of the Work.
- B. Examine walls and other adjacent construction for suitable conditions before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install postal specialties level and plumb, according to manufacturer's written instructions.
- B. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturer.
 - 1. Where aluminum contacts grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating.
 - 2. Final acceptance of postal specialties served by the USPS depends on compliance with USPS requirements.

3.3 FIELD QUALITY CONTROL

- A. Arrange for USPS personnel to examine and test postal specialties served by the USPS after they have been installed according to USPS regulations.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as postal specialties are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust doors, hardware, and moving parts to function smoothly, and lubricate as recommended by manufacturer. Verify that integral locking devices operate properly.
- C. Touch up marred finishes or replace postal specialties that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by postal-specialty manufacturer.
- D. Replace postal specialties that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. On completion of postal-specialty installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION 105500

SECTION 106200 - VINYL COATED WIRE SHELVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl Coated Wire Shelving

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
- B. Provide sample and catalog cut sheet for each type and size of shelving used.

1.3 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to replace products that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

- A. Materials: Constructed of steel wire coated with vinyl coating of PVC.
- B. Manufacturer: Basis of Design; Closet Maid by Clairson International.
 - 1. PVC thickness of 10-12 mils.
 - 2. Color White
- C. Unit Closets: Shelf with integral clothes rod, 12-inch wide unless otherwise shown on drawings.
- D. Linen and Pantry: 12-inch wide unless otherwise shown on drawings.
- E. Pantry Shelves: 16-inch wide unless otherwise shown on drawings, deck rods shall be 12-inch increments.

2.2 FABRICATION

- A. All rods shall be welded at intersection of cross deck wire.
- B. Deck rods spacing shall be on 1-inch increments unless otherwise noted.
- C. Cross deck wires shall be trimmed smooth to longitudinal wires.

PART 3 - EXECUTION:

- A. Mounting Hardware: Components shall provide for shelving installation to drywall without requiring mounting to concealed wall structural members.
- B. Installation of shelving shall be per manufacturer's written instructions.
- C. Provide support brackets for any shelf over 3 feet 6 inches span and additional brackets for every fraction thereof.
- D. Provide combination support/hold down clip every inches.
- E. Linen/storage shelving where ends are not supported by wall brackets shall be supported by manufacturer's standard vertical support pole.

END OF SECTION 106200

SECTION 107114 - DECORATIVE FAÇADE SCREEN STRUCTURE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Decorative Façade Screen Systems.

1.2 DEFINITIONS

- A. Maximum Working Load (MWL) is the maximum static and/or dynamic load at which the product will still function without excessive friction, distortion, wear or permanent deformation of components. Above this load, bearing systems may fail, moving parts may seize and stainless steel or plastic components may begin to bend, stretch or otherwise deform. Maximum working loads shall not exceed half of the breaking load, and shall not be exceeded by maximum design loading.
- B. Breaking Load (BL) is the published approximate load at which a major failure can be expected to occur to some part of the structure when new. Plastic components may split, rivets may give way, shackles may break, and other metallic components may fracture. Products shall not be used at more than half of the breaking load, to provide a minimum safety factor of two. The consulting engineer shall confirm that an appropriate safety factor is employed for the purpose of the intended application and consistent with all regulations and standards.
- C. The Maximum Working Loads, Breaking Loads, Minimum Yield Loads and Ultimate Loads detailed in this specification should only be considered in the context of the project application. The consulting engineer shall confirm that an appropriate safety factor is employed for the purpose of the intended application and consistent with all regulations and standards.

1.3 STANDARDS

- A. All work shall comply with the local building codes and national standards:
 - 1. American Institute of Steel Construction (AISC)
 - a. Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings
 - b. Code of Standard Practice for Steel Buildings and Bridges
 - c. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design.
 - 2. American Society for Testing and Materials (ASTM) as referenced herein and specifically the following:
 - a. ASTM D4851 Standard Test Methods for Coated and Laminated Fabrics for Architectural Use
 - b. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials

- c. ASTM A307-00 Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - d. ASTM A325-02 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- 3. American Iron and Steel Institute (AISI) latest edition with and as referenced
 - a. AISI Type 304
- 4. American Society of Civil Engineers (ASCE)
 - a. Standard 'Steel Construction Manual' Latest Edition
- 5. American Welding Society (AWS)
 - a. AWS D1 1 Structural Welding Code
 - b. AWS 2.4 Symbols for Welding and Nondestructive Testing
- 6. Aluminum Association
 - a. Specifications for Aluminum Structures
- 7. National Fire Protection Association (NFPA)
 - a. NFPA 701 Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.

1.4 SUBMITTALS

A. Bid Submittals:

- 1. Subcontractor shall submit the following information with its bid:
 - a. Number of years the company has been in business and number of years the company has been supplying fabric membrane structures and/or fabric façade structures.
 - b. Provide twenty (20) references showing projects of similar scale and similar amount of difficulty. Provide locations and contracts for referenced projects.
 - c. All names under which the company has operated and dates for the operational times of each company.
 - d. State in which the company is incorporated and date of incorporation.
 - e. Names of all corporate officers.
 - f. A detailed listing of any shareholders that own in excess of 5% and the percentage of shares owned by each.
 - g. Submit Subcontractor Qualifications per Quality Assurance section of this specification in writing with letter head proving they meet or exceed the qualifications of each of the 7 points.

B. Product Data and Specifications

- 1. Submit product data specification sheets for the following:
 - a. Architectural Decorative Mesh specification card with sample of material to be used. Provide copy of Manufacturer's written pass thru warranty for the material to be used.

- b. Specification sheets and supplementary information for finish system to be used for the project.
- c. Specification sheets for aluminum clamping and tensioning system extrusions.

C. Engineering Package (Shop Drawings and Structural Calculations)

1. General - Subcontractor shall submit Decorative Facade Screen Structure shop drawings illustrating the finished structure along with a completed engineering report. Structural calculations and engineering drawings for the project shall be prepared by, or under the direct supervision of a Professional Engineer employed by or retained by the subcontractor. The responsible engineer may be a direct employee of the subcontractor or a qualified consulting engineer.
2. Engineering Drawings
 - a. The drawings shall indicate all anchorage points along concrete structure and or steel, structural connection details, aluminum clamping and tensioning extrusion interface details, Architectural Decorative Mesh fabrication details including weld widths, and attachment details and the overall layout of mesh seaming.
 - b. The drawings shall indicate all materials and products to be used for the construction of the structure.
 - c. The cover sheet of the shop drawing submittal package shall indicate all structural information and related building code information used by the engineer for the design of the system.
3. Engineering Calculation Report
 - a. Large deflection numerical shape generation that will ensure a stable, uniformly stressed, three dimensionally curved shape that is in static equilibrium with the internal prestress forces and is suitable to resist all applied loads.
 - b. Large deflection finite element method structural analysis of the membrane system under all applicable applied wind, snow and live load conditions.
 - c. Finite element method structural analysis of the support frame system.
 - d. Connection design including bolt, weld, and secondary member sizing.
 - e. Biaxial mesh test specification, interpretation, and membrane compensation determination.

1.5 QUALITY ASSURANCE

- A. Subcontractor Qualifications: Fabrication and erection of a Decorative Facade Screen is limited to firms with proven experience in fabrication and construction of complex fabric membrane systems meeting the following minimum requirements:
1. Subcontractor is a member of the Industrial Fabrics Association International (IFAI).
 2. Subcontractor's engineering services must utilize Finite Element Analysis software that performs fabric form finding and takes into account fabric material properties and pre-stress characteristics.
 3. Subcontractor's responsibilities include fabricating and installing Decorative Facade Screen Structure and providing professional engineering services needed to assume engineering responsibility.
 4. Subcontractor must have been in continuous operation as a professional Fabric Membrane Structure and Decorative Facade Screen manufacturer for minimum of (10) years prior to contract.

5. Subcontractor has fabricated and erected at least thirty (30) custom PVDF coated polyester PES mesh Decorative Facade Screen, with at least twenty (20) structures of similar size and complexity as this project.
6. Demonstrate that the Subcontractor has adequate capacity and can maintain a staff experienced in the fabrication of PVDF coated polyester PES mesh who will undertake the fabrication of this project.
7. Subcontractor shall be certified has an ISO 9001 quality assurance fabrication manufacturer.

B. Installer Qualifications: Fabricator of products.

C. Source Quality Control:

1. Obtain primary materials from a single fabrication manufacturer; use secondary materials as recommended by primary fabrication manufacturer.
2. Subcontractor shall certify that products comply with reference standards and project specifications.
3. Subcontractor shall be certified by product manufacturer of the Architectural Decorative Mesh for installation and submit proof of certification.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual supporting and adjoining construction by field measurements before fabrication; and indicate recorded measurements on final Shop Drawings. Coordinate construction to ensure that pre-engineered veil system assemblies fit properly to supporting and adjoining construction and coordinate schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

- A. Workmanship Warranty: Subcontractor agree to repair or replace components of Decorative Facade Screen that fail in materials or workmanship within specified warranty period of one year from the date of Substantial Completion.
1. Failures include, but are not limited to, the following:
 - a. Deterioration of Architectural Decorative Mesh including fabricated seams.
 - b. Deterioration of Aluminum Clamping & Tensioning Extrusions and Fasteners, including metal finishes beyond normal weathering.
 2. Architectural Decorative Mesh Product Warranty: Provide Product Manufacturer 10-year pass through warranty.
- B. Prior to final payment, Subcontractor shall furnish Owner with a written Warranty, which warrants that the Architectural Decorative Mesh, its perimeter Aluminum Clamping and Tensioning Extrusion System and Fasteners and any structural support system (if included) as supplied by subcontractor has been installed in accordance with the project specifications and shall be free from defects in materials and workmanship that will impair its normal use or service.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. General: Provide a Decorative Facade Screen system that complies with requirements specified herein by testing the Subcontractor's corresponding membrane system in accordance with the indicated test methods.
 - 1. The Architectural Decorative Mesh used on these façades shall be PVDF coated polyester PES mesh.
- B. Comply with local building codes and respective basic wind speed, wind load importance factor and wind exposure category.
- C. Architectural Decorative Mesh Porosity (Opacity):
 - 1. Screen Mesh: 34% open
- D. Architectural Decorative Mesh Fire Performance: Range of characteristics required for PVDF coated polyester PES mesh facades:
 - 1. Burning Characteristics (ASTM E84):
 - a. Flame Spread: 5 max
 - b. Smoke Generation (Tunnel Test): 20 max.
 - 2. Flame Resistance (NFPA 701 Small Scale, UL 94):
 - a. Flame Out: 1 second after.
 - b. Char Length: 0.25-inch max.

2.2 MANUFACTURER

- A. Basis of Design product and Manufacturer; FLEXFACADES Cladding Screen System supplied, engineered, fabricated by Structurflex, LLC.
- B. Aluminum Clamping and Tensioning System Extrusions.
 - 1. Frame Type: FLEXFACADES Cladding Screen Extrusions:
 - a. "Perimeter Frame"
 - b. "Joint Frame"
 - c. "Cover"
 - d. "Cover Screws"
 - e. "Tensioning Clips"
 - 2. Materials:
 - a. Structural aluminum clamping systems: ASTM alloy 6061-T6.
 - 3. Finish: Mill Finish
 - 4. Fabrication:

- a. Fabricate aluminum extrusions with mitered corners.
- b. Fabricate aluminum extrusions without sharp edges.
- c. Stamp parts with appropriate mark number.
- d. Fabricate aluminum free of oil, grease, and machining chips.

C. Architectural Decorative Mesh Manufacturer

1. Mesh Type: FLEXFACADES Type 1A Ventilated PVDF PES Mesh:
 - a. Product Manufacturer: Mehler, Product: Valmex TF 400
 - 1) Porosity (Opacity): 34% open
 - 2) Color: One (1) Manufacturer standard colors selected by architect.
2. Material Characteristics:
 - a. Yarn: 1100 Dtex PES-HT.
 - b. Coating: PVDF lacquered polyvinyl.
 - c. Porosity (Opacity): +/- 34% open.
 - d. Total Mass: 12 min. ounces/square yard.
 - e. Flame Retardancy, NFPA 701: Passed.
 - f. ASTM E 84: Class A.
 - g. Warranty: Product Manufacturer 10-year pass thru warranty.
3. Fabrication:
 - a. Provide printed supergraphics on the Architectural Decorative Mesh with UV inks from Structurflex's authorized Printing Companies that has at least 10-years' experience with printing on this type of mesh. Printing Company to provide a 5-year pass thru warranty on the UV ink color fastness and adhesion of all non-magenta, non-red pigments colors. Printing excludes white UV inks color. High resolution electronic graphics will be provided by the Architect per Printing Company's digital art guidelines requirements.
 - b. Fabricator shall take necessary care to plan and assemble the fabricated sections such that assembly has no shop patches. Seams, if any, shall be patterned into a symmetrical and repetitive geometric arrangement within the assembly per fabrication manufacturer's engineering, shown on shop drawings and, where feasible, hidden by structural members. Utilize radio frequency (RF) welding bars to dull the sheen the welded seams of the said architectural decorative screen mesh.
 - c. Fabricate Architectural Decorative Mesh without wrinkles or creases onto perimeter Aluminum Clapping and Tensioning System Extrusions.

D. Fasteners

1. Manufacturer: Hilti or similar.
 - a. Product: Posted installed Screw Anchors into masonry or steel per fabrication manufacturer engineering requirement per local code.
2. Materials: Carbon steel fasteners conforming to ATSM A510, Grade 1018 to 1022.
3. Finish: Corrosion preventive coating complying with the minimum corrosion resistance requirements of ATSM F1941.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions and verify dimensions, tolerances, and method of attachment with other Work.

3.2 INSTALLATION

- A. Install Decorative Facade Screen and support structure plumb, level, and true.
- B. Tension the Architectural Decorative Mesh onto the perimeter Aluminum Clamping and Tensioning Extrusion system without wrinkles.
- C. Install Decorative Facade Screen and support structure per fabrication manufacturer's instructions and approved engineered shop drawings.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Protect installed products and finished surfaces from damage during construction.

3.4 CLEANING

- A. Clean installed products in accordance with manufacturer's instructions before owner's acceptance.
- B. Do not use abrasive cleaners or power washing.
- C. Legally dispose of construction debris associated with this work and remove from project site.

END OF SECTION 107114

SECTION 107314 – ALUMINUM AWNINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum Awnings.

1.2 SUBMITTALS

- A. Product Data: Submit product data, specifications, component performance data and installation instructions.
- B. Shop Drawings: Submit detailed drawings, layout metal canopies and supports, all mechanical joint locations with complete details, connections, jointing and accessories.
- C. Calculations: Provide signed and sealed structural calculations produced by a professional structural engineer registered in the state where the project is located.
- D. Samples:
 1. Samples for Verification: Manufacturer's standard samples for color indicated.

1.3 PERFORMANCE REQUIREMENTS

- A. System Performance: Provide metal canopy system that has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with Standard Building Code requirements for geographic area in which work is located and as follows:
 1. Live Load: 30-psf minimum.
 2. Design Wind Velocity: As indicated on the Drawings.
- B. Structure shall be capable of sustaining severe weather including rain, hail, and hurricane force winds, and supporting a concentrated load such as being walked upon.

1.4 QUALITY ASSURANCE

- A. Installer Qualification: Firm with not less than three (3) years' experience in installation of aluminum walkway covers of type, quantity and installation methods similar to canopy system indicated.
- B. Shop Assembly: Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.5 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer agrees to repair or replace components of aluminum-framed entrances and 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. **Finish Warranty:** Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
 - 1. **Warranty Period:** Minimum 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PREFABRICATED ALUMINUM CANOPIES

- A. **Product and Manufacturer:** Subject to compliance with requirements, available products and manufacturers that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Dittmer Architectural Aluminum
 - 2. Mapes Architectural Canopies, LLC
 - 3. Perfection Architectural Systems
 - 4. Sundance Architectural Products, LLC
- B. **Fascia Profile:** As indicated.

2.2 MATERIALS

- A. **Aluminum:** All aluminum extrusions shall be alloy 6063 heat treated to a T-6 temper.
- B. **Fasteners:** Manufacturer's standard.

2.3 FABRICATION

- A. **General:** Comply with indicated profiles, dimensioned requirements and structural requirements.
- B. **Framing:** Beams and columns shall consist of shop welded one piece units.
 - 1. Use sections true to details with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture, free from defects impairing strength and durability.
 - 2. All welding shall be in accordance with manufacturer's requirements.
 - 3. Mechanical joints shall consist of stainless-steel bolts with a minimum of two (2) bolts per fastening. Bolts and nuts shall be installed in a concealed manner utilizing 1/2" thick by 1 1/2" aluminum bolt bars welded to structural members.
- C. **Roof Deck:** Extruded aluminum shapes, interlocking self-flashing sections. Shop fabricate to lengths and panels widths required for field assembly. Depth of sections shall comply with structural requirements.

1. Exposed Rivets: Rivets used to fasten bottom of fascia to deck shall be finished to match the deck.

2.4 ALUMINUM FINISH

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in both color coat and clear topcoat.
 1. Color and Gloss: Color as selected by Architect from Manufacturers full range.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install metal canopies in accordance with the manufacturer's instructions.
 1. Field confirm dimensions and elevations shown.
 2. Install roof deck sections, accessories and related flashing in accordance with manufacturer's instructions. Provide roof slope for rain drainage without ponding water. Align and anchor roof deck units to structural support frames.

3.2 CLEANING AND PROTECTION

- A. Damaged Units: Replace roof deck panels and other components of the work that have been damaged or have deteriorated beyond successful minor repair.
- B. Cleaning: Remove protective coverings at time in project construction sequence that will afford greatest protection of work. Clean finished surfaces as recommended by manufacturer. Maintain in a clean condition during construction.
- C. Protection: Provide protection and surveillance, as required to ensure that work of this section will be without damage or deterioration at time of substantial completion.

END OF SECTION 107314

SECTION 122114 – WINDOW AND DOOR BLINDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Horizontal and Vertical louver blinds.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 LOUVER BLINDS – GENERAL

- 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. Hunter Douglas Contract.
 - 2. Levolor Contract; a Newell Rubbermaid company.
 - 3. Springs Window Fashions.

2.2 HORIZONTAL LOUVER BLINDS

- A. Polymer Slats: Lead free, UV stabilized.
 - 1. Width: 1 inches.
 - 2. Profile: Manufacturer's standard.
- B. Headrail:
 - a. Manufacturers Standard Aluminum Rail.
 - 2. Manual Lift Mechanism:
 - a. Manufacturers Standard
 - 3. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - a. Operator: Manufacturers Standard.
 - 4. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard.
- C. Bottom Rail: Matching slats.

1. Type: Manufacturer's standard.
- D. Ladders: Braided cord.
- E. Valance: Manufacturer's standard.
- F. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 1. Type: End.
 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- G. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- H. Colors, Textures, Patterns, and Gloss:
 1. Slats: As selected by Architect from manufacturer's full range.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.

2.4 VERTICAL LOUVER BLINDS

- A. PVC Vanes: Lead-free, UV-stabilized; with not less than 3/8-inch overlap when vanes are rotated fully closed.
 1. Width: 3-1/2 inches.
 2. Profile: Crowned.
 3. Features:
 - a. Bottom chain.
- B. Headrail: Encloses operating mechanisms including carrier-spacing mechanism that provides uniform vane spacing when blinds are traversed fully across headrail (closed).
 1. Manual Traverse Control: Nickel-plated metal bead chain.
 2. Manual Rotation Control: Nickel-plated metal bead chain.
 3. Manual Control Locations: As indicated on Drawings.
 4. Draw and Stack: One way, stack left or one way, stack right per hand of door.
 5. Cord-Tensioner Mounting: Wall.
- C. Carriers: Engineered plastic with gears to align and synchronize vane rotation and stems that allow vane removal and replacement. Lead carriers have self-lubricating wheels or elongated bearing surfaces; following carriers have self-lubricating wheels.

- D. Valance: Manufacturer's standard with vane insert.
- E. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: For headrail recessed in pocket.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- F. Colors, Textures, and Patterns:
 - 1. Vanes:
 - a. PVC: As selected by Architect from manufacturer's full range.

2.5 VERTICAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate vertical louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
- B. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Install mounting and intermediate brackets to prevent deflection of headrails.
- C. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.
- D. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

END OF SECTION 122114

SECTION 123530 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

1. Cabinets.

1.2 SUBMITTALS

- A. Product Data: For the following:

1. Cabinets.
2. Cabinet hardware.

- B. Shop Drawings: Include plans, elevations, details, and attachment. Show materials, finishes, filler panels, and hardware.

- C. Samples: For cabinet finishes.

PART 2 - PRODUCTS

2.1 CABINETS

- A. Available Products: Subject to compliance with requirements, cabinets that may be incorporated into the Work include, but are not limited to, the following:

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

- a. Gibraltar Cabinets
- b. Leedo Cabinetry.
- c. Mastercraft Cabinets, Elkay Manufacturing Co.
- d. Saco Industries, Inc.

- C. Face Style: Reveal overlay.

- D. Cabinet Style: Face Frame.

- E. Door and Drawer Fronts: Solid-wood stiles and rails, 3/4-inch-thick, with 1/4-inch-thick, veneer-faced plywood center panels.

- F. Face Frames: 3/4-by-1-5/8-inch solid wood.

- G. Exposed Cabinet End Finish: Wood veneer.

2.2 CABINET MATERIALS

- A. General: Manufacturer's standard materials for cabinet series indicated.
- B. Exposed Materials:
 - 1. Exposed Wood Finish: As Selected by Architect from Manufacturer's full range.
- C. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility.

2.3 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- B. Install cabinets without distortion so doors and drawers fit openings and are aligned. Complete installation of hardware and accessories as indicated.
- C. Install casework level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten cabinets to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

3.2 ADJUSTING AND CLEANING

- A. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

END OF SECTION 123530

SECTION 123640 - STONE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone countertops.

1.2 SUBMITTALS

A. Product Data: For stone units indicated.

B. Shop Drawings: Include plans, sections, details, and attachments to other work.

1. Show direction of veining, grain, or other directional pattern.

C. Samples for Verification:

1. For each stone type indicated, in sets of Samples not less than 12 inches square. Include two or more Samples in each set and show the full range of variations in appearance characteristics expected in completed Work.

D. Material Test Reports:

1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, according to referenced ASTM standards. Base reports on testing done within previous three years.
2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone.

E. Maintenance Data: For stone countertops to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

1.3 QUALITY ASSURANCE

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

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.

1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.

2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 GRANITE

- A. Material Standard: Comply with ASTM C 615.
- B. Stone Type and Color: Match Architect's samples.
 1. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
 - a. Thickness: 3 cm at kitchen and common areas, 2 cm at bathrooms in units.
 - b. Edge Detail: Full Bullnose.
 - c. Cutouts and Holes: As indicated.
 - d. Backsplash: Refer to Section 093000 "Tiling."

2.2 ADHESIVES, GROUT, SEALANTS, AND STONE ACCESSORIES

- A. General: Use only adhesives formulated for stone and ceramic tile and that are recommended by their manufacturer for the application indicated.
- B. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 079200 "Joint Sealants" and will not stain the stone it is applied to.
 1. Color: As selected by Architect from manufacturer's full range.
- C. Stone Cleaner: Specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer and by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- D. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.

2.3 STONE FABRICATION, GENERAL

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.

1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.
- B. Grade and mark stone for final locations to produce assembled countertop units with an overall uniform appearance.
- C. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated.
 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
 2. Clean sawed backs of stones to remove rust stains and iron particles.
 3. Cut and drill sinkages and holes in stone for anchors, supports, and attachments.
 4. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
 5. Finish exposed faces of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups. Provide matching finish on exposed edges of countertops, splashes, and cutouts.
- D. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive stone countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone countertops.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone countertops.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONSTRUCTION TOLERANCES

- A. Variation from Level: Do not exceed 1/8 inch in 96 inches, 1/4 inch maximum.

3.3 INSTALLATION OF COUNTERTOPS

- A. Do not cut stone in field unless otherwise indicated. If stone countertops or splashes require additional fabrication not specified to be performed at Project site, return to fabrication shop for adjustment.
- B. Set stone to comply with requirements indicated. Shim and adjust stone to locations indicated, with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and other attachments indicated or necessary to secure stone countertops in place.

3.4 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Remove and replace stone countertops of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective countertops.
 - 3. Interior stone countertops not matching approved Samples and mockups.
 - 4. Interior stone countertops not complying with other requirements indicated.
- C. Replace in a manner that results in stone countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.
- D. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.

END OF SECTION 123640

SECTION 123661 - SIMULATED STONE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Simulated stone countertops and backsplashes.

1.2 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.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

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

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE 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. Basis of Design Product and Manufacturer; as indicated on the Interior Design Documents, or a comparable product by:
 - a. Wilsonart.
 - 2. Colors and Patterns: As indicated on the Interior Design Documents.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Countertop thickness: 3 cm for unit kitchens and amenities, 2 cm for unit bathrooms.
- C. Backsplashes: As indicated on the Interior Design Documents.
 - 1. Height: As Indicated.
- D. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
- E. Joints: Fabricate countertops without joints.
- F. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting into fixture opening.

- 1) Projection depth: As Indicated.
2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to

finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

- H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661

SECTION 129313 - BICYCLE RACKS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes Bicycle Racks

1.2 SUBMITTALS

- A. Product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.
- B. Shop drawings, including plans and elevations, indicating overall dimensions.

1.3 WARRANTY

- A. Manufacturer's standard warranty: Manufacturer agrees to repair or replace components of bicycle rack and equipment that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Bike Rack: Basis-of-Design Product and Manufacturer; Dero, Model Ultra Space Saver.
 - 1. Mounting: Surface mount.
 - 2. Configuration: As indicated.
 - 3. Quantity and locations: as indicated on the drawings.

2.2 FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 ADJUSTING AND CLEANING

- A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions.
- B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.
- C. Clean racks and equipment promptly after installation in accordance with manufacturer's instructions.

3.3 PROTECTION

- A. Protect installed racks and equipment to ensure that, except for normal weathering, racks will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 129313

SECTION 142100 - ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes electric traction passenger elevators.

1.2 SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and large-scale details indicating service at each landing, control closet, coordination with building structure, relationships with other construction, and locations of equipment.
 - 2. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Samples: For exposed finishes.
- D. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and control closet layout and dimensions, as shown on Drawings, and electrical service including standby power generator, as shown and specified, are adequate for elevator system being provided.
- E. Qualification Data: For Installer.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard five year maintenance agreement, starting on date initial maintenance service is concluded.

1.4 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: one year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on the drawings, or comparable product by one of the following:
 - 1. Otis Elevator Co.
 - 2. Schindler Elevator Corp.
 - 3. ThyssenKrupp Elevator.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with Section 407 in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

2.3 ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.
- B. Elevator Description:
 - 1. Rated Load: As Indicated.
 - 2. Rated Speed: As Indicated.
 - 3. Operation System: Selective-collective automatic operation.
 - 4. Auxiliary Operations:
 - a. Standby power operation.
 - b. Battery-powered lowering.
 - c. Automatic dispatching of loaded car.
 - d. Nuisance call cancel.
 - e. Loaded-car bypass.
 - f. Distributed parking.
 - 5. Security Feature: Keyswitch operation.
 - 6. Car Enclosures:
 - a. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.
 - b. Car Fixtures: Satin stainless steel, No. 4 finish.
 - c. Side and Rear Wall Panels: Satin stainless steel, No. 4 finish.
 - d. Door Faces (Interior): Satin stainless steel, No. 4 finish.
 - e. Ceiling: Polished stainless steel, No. 8 finish.
 - f. Handrails: 1/2 by 2 inches rectangular satin stainless steel, No. 4 finish, at rear of car.
 - g. Floor prepared to receive ceramic tile.
 - 7. Hoistway Entrances:

- a. Width: 42 inches.
 - b. Height: 84 inches.
 - c. Frames: Satin stainless steel, No. 4 finish.
 - d. Doors: Satin stainless steel, No. 4 finish.
- 8. Hall Fixtures: Satin stainless steel, No. 4 finish.
 - 9. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from polished stainless steel, No. 8 finish.
 - b. Provide hooks for protective pads and one complete set(s) of full-height protective pads.

2.4 TRACTION SYSTEMS

- A. Elevator Machines: Variable-voltage, variable-frequency, ac-type hoisting machines or variable-voltage dc-type hoisting machines and solid-state power converters.
 - 1. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
 - 2. Provide means for absorbing regenerated power when elevator system is operating on standby power.
- B. Fluid for Hydraulic Buffers: If using hydraulic buffers, use only fire-resistant fluid.
- C. Machine Beams: Provide framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.
- D. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

- A. General: Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.
- B. Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:
 - 1. Single-Car Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at main lobby.
 - 2. Single-Car Battery-Powered Lowering: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to the next floor below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.

2.6 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.7 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.
 - 1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.
 - 1. Fire-Protection Rating: 1-1/2 hours.
- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
 - 1. Enameled-Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel finish; colors as selected by Architect from manufacturer's full range.
 - 2. Stainless-Steel Frames: Formed from stainless-steel sheet.
 - 3. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches high, on both inside surfaces of hoistway door frames.
 - 4. Sight Guards: Provide sight guards on doors matching door edges.
 - 5. Sills: Extruded aluminum, with grooved surface, 1/4 inch thick.
 - 6. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.8 SIGNAL EQUIPMENT

- A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life lamps and acrylic or other permanent, non-yellowing translucent plastic diffusers or LEDs.
- B. Car-Control Stations: Provide manufacturer's standard recessed or semirecessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
 - 1. Provide "No Smoking" sign matching car-control station, with text and graphics as required by authorities having jurisdiction.

- C. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service.
- D. Car Position Indicator: Providedigital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.
- E. Hall Push-Button Stations: Provide hall push-button stations at each landing as indicated.
- F. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide one of the following:
 - 1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.
- G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
- H. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed. For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.
- I. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction. Provide one sign at each hall push-button station unless otherwise indicated.

2.9 FINISH MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
- B. Stainless-Steel Bars: ASTM A 276, Type 304.
- C. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
- D. Aluminum Extrusions: ASTM B 221, Alloy 6063.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- B. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.
- C. Leveling Tolerance: 1/8 inch, up or down, regardless of load and travel direction.
- D. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

E. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

3.3 PROTECTION

A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
3. Engage elevator Installer to provide full maintenance service.
4. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).

3.5 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 60 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity.

END OF SECTION 142100

SECTION 149100 - FACILITY CHUTES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Waste chutes.

1.2 DEFINITIONS

- A. Chase: The shaft that encloses a chute.
- B. Intake Door: Door or hatch that penetrates the chase wall and chute, and through which materials are fed into the chute.
- C. Discharge Door: Door or hatch at the bottom of a chute, through which materials exit the chute.
- D. Access Door: Door other than an intake or discharge door that penetrates the chase wall for service access to devices in the chase.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chutes.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include each type and location of intake, discharge, and access door.

C. Coordination Drawings: Plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Size and construction of chase enclosing each chute; locations for power, signal, and control wiring; and sprinkler-piping and water-service connections.
2. Chute-discharge locations coordinated with compactor-intake or container locations.

D. Product Certificates: For each type of chute, from manufacturer.

E. Operation and Maintenance Data: For chutes to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: Valiant Products.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing and inspecting agency, for fire-protection ratings indicated.
 - 1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
 - 2. Intake Doors: UL "B" Labeled, 1-1/2-hour fire-resistance rated with 30-minute temperature rise of 250 deg F.
 - 3. Access Doors: UL "B" Labeled, 1-1/2-hour fire-resistance rated with 30-minute temperature rise of 250 deg F.
- B. Discharge-Door Assemblies: Fire-resistive door construction according to NFPA 252 or UL 10B requirements for fire-rated door assemblies.
 - 1. Minimum 16 gauge aluminized steel type "A" open end chute discharge rolling steel door with 165°F. fusible link hold open on an inclined steel track at the bottom of the chute to close automatically when the ambient temperature reaches 165°F. as required by city or state building and/or fire codes.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Standard: Provide chutes complying with NFPA 82.

2.3 CHUTES

- A. Chute Metal: Aluminized steel.
 - 1. Thickness: Minimum 16 gauge.
- B. Chute Size: As indicated.
- C. External Reinforcing for Offsets: Additional thickness of 0.11-inch thick chute metal with bracing to structure.

2.4 DOORS

- A. Intake-Door Assemblies: ASTM A 240, Type 304, stainless-steel self-closing units with positive latch and latch handle, with stainless-steel trim; constructed as required for performance requirements indicated; and with frame suitable for the enclosing chase construction.
 - 1. Door Type: Bottom hinged, hand operated self-closing positive latching.
 - 2. Size: Manufacturer's standard size for door type, chute type, and diameter indicated.
 - 3. Finish: Manufacturer's standard satin or No. 3 directional polish.
 - 4. Latchset: Manufacturer's standard.

5. Mechanical Interlocks: Interlock system for system servicing, operated from discharge door to automatically lock intake doors.
 6. Electrical Interlocks: Interlock system that is energized by opening one intake door; remaining intake doors automatically lock when system is energized.
 7. Baffles: Rubber backdraft baffles at each intake.
- B. Discharge-Door Assemblies: 16 gauge aluminized steel type "A" open end chute discharge rolling steel door with 165°F. fusible link hold open on an inclined steel track at the bottom of the chute to close automatically when the ambient temperature reaches 165°F. as required by city or state building and/or fire codes.
- C. Detector System: Heat- and smoke-detecting interlock system with temperature-rise elements that locks chute doors when temperature in chute reaches a predetermined, adjustable temperature.
1. Locate smoke detector outside discharge door with solenoid to close discharge door.
- D. Access-Door Assemblies: Manufacturer's standard hand operated, self-closing, positive latching, UL 1 1/2-hour. "B" labeled complying with ASTM A 240, Type 302/304, stainless-steel doors with trim; constructed as required for performance requirements indicated; with frame suitable for the enclosing chase construction; and in satin or No. 3 directional polish finish; equipped with cylinder locks that release latch with keys that are removable only when cylinder is locked.
1. Lock Cylinder: Provide cylinders that match and are keyed to the building system.
 2. Keying: Key access-door cylinders to master key system.
 3. Keys: Three for each cylinder.
- E. Manual Control System: Control system with manual switch that lock chute doors during shutdown hours and service operations.

2.5 ACCESSORIES

- A. Chute Fire Sprinklers: NFPA 13; manufacturer's standard, recessed, automatic, NPS 1/2 sprinklers; ready for piping connections.
- B. Flushing Spray Unit: NPS 3/4 spray-head unit located in chute above highest intake door, ready for hot-water piping connection, and with access door for spray-head and piping maintenance. Provide additional 1/2-inch sprinkler heads at every second intake (counting from the top) or as required by local code.
- C. Disinfecting and Sanitizing Unit: NPS 3/4 disinfecting and sanitizing spray-head unit located in chute above highest intake door, including 1-gal. tank and adjustable proportioning valve with bypass for manual control of sanitizing and flushing operation, ready for hot-water piping connection, and with access door for spray-head and piping maintenance.
- D. Intake-Door Baffles: Rubber baffles, 1/8 inch thick.
- E. Sound Dampening: Manufacturer's standard sound-deadening coating on exterior of chute sound and vibration isolator pads at supporting frame at each floor penetration.

2.6 FABRICATION

- A. General: Factory-assemble chutes to greatest extent practicable with nonleaking, continuously welded or lock-seamed joints without bolts, rivets, or clips projecting into chute interior. Include intake-door assemblies, metal supporting framing at each floor, and chute expansion joints between each support point.
 - 1. The trash chute shall be fully factory assembled and all joints, except those required to separate the sections for shipment and installation shall be welded or lock-seamed tight. The floor intake doors shall be bolted in place on throats formed into the chute. All chute sections shall flash inside the sections below and there shall be no bolts, clips, or other projections inside the chute to snag the flow of material. Pre-positioned support frames shall assure proper intake levels and there shall be an expansion joint in the chute between all support joints. Discharge hoppers and offsets, where required, shall be reinforced and separately supported in the impact area.
- B. Offsets: Construct offsets where indicated on Drawings. Fabricate so that installed chute is without obstructions that might prevent materials from free falling within chute. Offsets shall be made the same diameter and gauge as the chute and have an additional layer of 13 gauge aluminized steel reinforcing the impact area.
 - 1. Offsets: Do not exceed a 15 degree maximum offset angle at any point, or place offset closer than 48 inches to nearest door above offset.
 - 2. External Reinforcing: Externally reinforce impact area of offsets located below top intake door. Install vibration isolators where braced to structure.
- C. Roof Vent: Fabricate vent unit as full-size extension of chute, open to the atmosphere. Extend vent to height above roofing surface as indicated on Drawings. Equip vent with full insect screening and metal explosion-release cap. Fabricate with roof-deck flange, counterflashing, and clamping ring of nonferrous metal compatible with chute metal.
- D. Chute Fire Sprinklers: Install internally within chute, recessed out of the chute area through which material travels, and according to NFPA 13.
 - 1. Locate sprinklers at or above the top intake door of the chute, and in addition, a sprinkler shall be installed within the chute at alternate floor levels and with sprinkler located at the lowest service level.
- E. Equipment Access: Fabricate chutes with access for maintaining equipment located within the chute, such as flushing and sanitizing units, fire sprinklers, and plumbing and electrical connections.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install and test chutes before installing enclosing chase construction.
- B. Install chutes according to NFPA 82 and manufacturer's written instructions. Assemble components with tight, nonleaking joints. Anchor chutes securely to supporting structure to withstand impacts and stresses. Install chute and components to maintain fire-resistive performance of chute and the enclosing chase construction.

- C. Install chutes plumb, without obstructions that might prevent materials from free falling within chutes.
- D. Anchor flanges of chute vents to roof curbs before installing roofing and flashing. Install chute-vent counterflashing after roofing and roof-penetration flashing are installed.
- E. Intake and Discharge Doors: Interface door units with throat sections of chutes for safe, snag-resistant, sanitary depositing of materials in chutes.
 - 1. Coordinate installation of foot-pedal door operator with installation of door and the enclosing chase construction.
 - 2. Interconnect sanitizer control with door interlock system.
- F. Test and adjust chute components after installation. Operate doors, locks, and interlock systems to demonstrate that hardware operates properly and smoothly and electrical wiring is connected correctly.
- G. Test heat- and smoke-sensing devices for proper operation.
- H. Operate sanitizing unit through one complete cycle of chute use and cleanup, and replenish chemicals or cleaning fluids in unit containers.
- I. Plumbing Access Doors: After construction of chase enclosure, verify that access doors have been correctly located and properly installed for their purpose.

3.2 CLEANING

- A. After completing chase enclosure, clean exposed surfaces of chute system's components. Do not remove labels of testing and inspecting agencies.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain each chute and related equipment.
- B. Demonstrate replenishment of sanitizing-unit chemicals or cleaning fluids.

END OF SECTION 149100

SECTION 211300 - FIRE SUPPRESSION SPRINKLERS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. Pipe fittings, valves, connections, and other materials required for a complete system.
- C. System design, engineering, fabrication, installation, and certification.
- D. Fire department connections.

1.02 REFERENCE STANDARDS

- A. ASME B16.1 - Gray Iron Pipe Flanges and Glanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers; 2005.
- B. ASME B16.3 - Mallable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).
- C. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).
- F. NFPA 13R - Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height; National Fire Protection Association; 2010.
- G. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.ca.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Shop Drawings:
 - 1. Submit preliminary layout of finished ceiling areas indicating sprinkler locations coordinated with ceiling installation, on stage exposed pipe routes and sprinkler head locations.
 - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
 - 3. Submit shop drawings, product data, and hydraulic calculations to authority having jurisdiction and Fire Marshall for approval.
 - 4. Submit final and authorities' approved shop drawings, product data and hydraulic calculations for Owner's review.
- D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.
- F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
 2. Sprinkler Wrenches: For each sprinkler type.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of referenced design and installation standard on site.
- B. Designer and Installer Qualifications: Licensed in the state of Georgia and specialized in design and performing the work of this section with at least 5 years' experience in this type of installations.
- C. Designer and Installer Qualifications: Licensed in the state of Georgia and specialized in design and performing the work of this section with at least 5 years' experience in this type of installations.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.06 EXTRA MATERIALS

- A. See Section 01 60 00 - Product Requirements, for additional provisions.
- B. Provide extra sprinklers of type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
- C. Provide suitable wrenches for each sprinkler type.
- D. Provide metal storage cabinet.

PART 2 – PRODUCTS

2.01 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: comply with NFPA 13.
- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Interface system with building control system.
- E. Sprinkler density shall be 0.15 gpm per sq. ft. over 2500 sq. ft. of the most remote area.
- F. Spacing of sprinkler heads shall be 120 sq. ft. per head maximum.
- G. Provide fire department connections.
- H. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.02 SPRINKLERS

- A. Ordinary temperature rating except in locations where temperatures are expected to exceed 100F. Furnish spare heads and wrenches in accord with NFPA 13.

B. Color and Type of Sprinkler Heads:

1. All sprinkler heads in suspended ceiling areas which are shown on Architectural Reflected Ceiling Plans, including outdoor canopies, shall be concealed type with color to match the adjacent surface, unless otherwise indicated.
 - a. At false beams, provide Series RF II - 5.6 K-Factor Royal Flush II sprinkler heads manufactured by Tyco Fire and Building Products with FM Global approval (no known equal).
 - b. At skylights, provide concealed sidewall head. Do not run piping over skylight glass, to avoid shadows.
2. All sprinkler heads in ceilings that are not shown on Architectural Reflected Ceiling Plans shall be semi-recessed type.
3. All sprinkler heads in exposed structures shall be exposed pendant or upright type, brass color, unless otherwise indicated.
4. All special colors shall be factory coated by the sprinkler head manufacturer.
5. Refer to Architectural Reflected Ceiling Plans and Plumbing Drawings for locations and types of sprinklers.

2.03 ACCEPTABLE MANUFACTURERS

- A. Tyco Fire and Building Products: www.tyco-fire.com
- B. The Viking Corporation: www.vikingcopr.com
- C. The Reliable Automatic Sprinkler Co., Inc.: www.reliablesprinkler.com

2.04 PIPING SPECIALTIES

A. Buried Piping:

1. Cast Iron Pipe: AWWA C151/A21.51.
 - a. Fittings: AWWA C110, standard thickness.
 - b. Joints: Restrained type, consisting of bolted mechanical joint supplemented with a mechanical joint retainer gland, along with thrust block.
 - c. Mechanical Coupling: Shaped composition sealing gasket, steel bolts, nuts, and washers.

B. Above Ground Piping:

1. Steel Pipe: ASTM A 53 Schedule 40, black. Schedule 10 pipe is prohibited.
 - a. Malleable Iron Fittings: ASME B16.3, threaded fittings.
 - b. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers, galvanized for galvanized pipe.
 - c. Cast Iron Fittings: ASME B16.1, flanges and ganged fittings and ASME B16.4, threaded fittings.

C. Pipe Hangers and Supports: All pipe hangers and supports shall be UL and FM approved.

D. Fire Department Connections:

1. Type: Free standing type with ductile iron pedestal red enamel finish.
2. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.
3. Drain: 3/4 inch automatic drip, outside.
4. Label: "Sprinkler - Fire Department Connection".

E. Valves:

1. Provide OS&Y gate or butterfly valves.

2. Provide stainless steel chains, by Cableco Model No. 019-3311 for all backflow preventer control valves.
 3. Provide tamper switches for all control valves of sub-feed risers.
- F. Water Flow Indicator:
1. Model WFD manufactured by Reliable, or equal by Potter-Roehmer, vane-type water flow detector for all risers, complete with DPDT switch and adjustable retard with FM Global approval for intended use.
- G. Fire Hose System:
1. Pipe and fittings: On systems served from sprinkler system, same as specified for sprinkler system. On systems served from domestic systems, same as specified for domestic system.
 2. Fire hose cabinets: Potter-Roemer (basis of design), or equivalent by W.D. Allen or Elkhart.
 - a. Cabinet: Potter-Roemer Model No. 1026, stainless steel.
 - b. Rack: Potter-Roemer Model No. 2710, FM Global-approved, including 1-1/2 inch rough brass 300 lb. UL-listed angle valve, 100 ft. of 1-1/2 inch 100 percent synthetic hose (neoprene tube and all Dacron jacket, FM-labeled).
 3. Extinguishers: Refer to Section 10 44 00 Fire Protection Specialties.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install sprinkler heads in all spaces, including, but not limited to:
 1. Overhangs that are 4 ft. or wider.
 2. Combustible concealed spaces.
 3. Under platforms.
 4. EER, ER, and dimmer rooms.
- C. Install equipment in accordance with manufacturer's instructions.
- D. Provide approved double check valve assembly at sprinkler system water source connection.
- E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.
- F. Place pipe runs to minimize obstruction to other work.
- G. Place piping in concealed spaces above finished ceilings.
- H. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- I. Install and connect to fire pump system in accordance with Section 21 30 00.
- J. Flush entire piping system of foreign matter.
- L. Hydrostatically test entire system.
- M. Require test be witnessed by Fire Marshal, authority having jurisdiction.
- N. Locate heads in guest areas in accord with Architecture Reflected Ceiling Plan (if shown).
- O. Run piping exposed in spaces where construction is exposed or where finish is applied to underside of slab. In rooms with suspended plaster or acoustic tile ceilings, run piping in space above ceiling. Install heads in upright position except where concealed pipe is specified.
- P. Connect kitchen hood to fire sprinkler system with PRV set to 55 psi.

- Q. Connect all fire hose cabinets with a 2 in. pipe from the sprinkler system piping.
- R. In existing spaces with new ceilings, removed all existing piping that interferes with new finishes or other new elements. Install new piping to new sprinkler heads. Make connection to existing system.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Inertia bases.
- B. Vibration isolators.
- C. Seismic restraints.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide schedule of vibration isolator type with location and load on each.
- C. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each. Indicate seismic control measures.
- D. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Isolation Technology, Inc; Model : www.isolationtech.com.
- B. Kinetics Noise Control, Inc;
- D. Peabody Noise Control, Inc. (Peabody), Dublin, OH.
- E. M.W. Sausse and Co. (Sausse), Valencia, CA.
- F. Substitutions: Not permitted.

2.02 INERTIA BASES

- A. Structural Bases:
 - 1. Construction: Welded structural steel with gusseted brackets, to support equipment and motor, with motor slide rails.
 - 2. Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.
- B. Concrete Inertia Bases:
 - 1. Construction: Structural steel channel perimeter frame, with gusseted brackets and anchor bolts, reinforcing; concrete filled.
 - 2. Mass: Minimum of 5 times weight of isolated equipment.
 - 3. Connecting Point: Reinforced to connect isolators and snubbers to base.
 - 4. Concrete: Minimum 3000 psi concrete.

2.03 VIBRATION ISOLATORS

- A. Open Spring Isolators:
 - 1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
 - 2. Spring Mounts: Provide with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
 - 3. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.

4. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.
- B. Restrained Open Spring Isolators:
 1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
 2. Spring Mounts: Provide with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
 3. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
 4. Restraint: Provide heavy mounting frame and limit stops.
 5. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.
- C. Closed Spring Isolators:
 1. Type : Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
 3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance.
 4. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.
- D. Restrained Closed Spring Isolators:
 1. Type : Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
 3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.
 4. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.
- E. Spring Hanger:
 1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
 2. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators.
 3. Misalignment: Capable of 20 degree hanger rod misalignment.
 4. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.
- F. Neoprene Pad Isolators:
 1. Rubber or neoprene waffle pads.
 - a. Hardness: 30 durometer.
 - b. Thickness: Minimum 1/2 inch.
 - c. Maximum Loading: 50 psi.
 - d. Rib Height: Maximum 0.7 times width.
 2. Configuration: Single layer.
 3. Configuration: 1/2 inch thick waffle pads bonded each side of 1/4 inch thick steel plate.
- G. Rubber Mount or Hanger: Molded rubber designed for 0.4 inch deflection with threaded insert.
- H. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

- I. Seismic Snubbers:
 - 1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
 - 2. Elements: Replaceable neoprene, minimum of 0.75 inch thick with minimum 1/8 inch air gap.
 - 3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
 - 4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Bases:
- C. Rubber
- D. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- E. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.
- F. Provide pairs of horizontal limit springs on fans with more than 6.0 inches WC static pressure, and on hanger supported, horizontally mounted axial fans.
- G. Provide seismic snubbers for all equipment, and piping mounted on isolators. Each inertia base shall have minimum of four seismic snubbers located close to isolators. Snub equipment designated for post-disaster use to 0.05 inch maximum clearance. Other snubbers shall have clearance between 0.15 inch and 0.25 inch.
- H. Support piping connections to equipment mounted on isolators using isolators or resilient hangers to nearest flexible pipe connector.
 - 1. Up to 4 Inches Pipe Size: First three points of support.
 - 2. 5 to 8 Inches Pipe Size: First four points of support.
 - 3. 10 inches Pipe Size and Over: First six points of support.
 - 4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.02 FIELD QUALITY CONTROL

- A. Inspect isolated equipment after installation and submit report. Include static deflections.

3.03 SCHEDULES

- A. Pipe Isolation Schedule.
 - 1. 1 Inch Pipe Size: Isolate 120 diameters from equipment.
 - 2. 2 Inch Pipe Size: Isolate 90 diameters from equipment.
 - 3. 3 Inch Pipe Size: Isolate 80 diameters from equipment.

END OF SECTION

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 GENERAL PROVISIONS

- A. Provisions specified in Section 22 05 10, Plumbing Basic Mechanical Requirements and Methods, apply to all work of Division 22.

1.02 SECTION INCLUDES

- A. Pipe identification.
- B. Equipment identification.
- C. Valve identification.
- D. Pipe Markers.

1.03 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating: Identification painting.
- B. Section 22 05 10 - Basic Plumbing Requirements and Methods.
- C. Section 22 10 05 - Plumbing Piping.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Brady
- B. Mystic
- C. Seton

2.02 PIPE IDENTIFICATION:

- A. Provide marking tape bands at 50-ft. intervals on all pipe in accessible locations, including spaces above removable ceilings. Provide additional marking tape bands as each pipe enters or exits equipment rooms, and at all equipment connections. Bands shall identify content and direction of flow based on nomenclature on Drawings legend.
- B. Color coding and size of letters and arrows shall conform to ANSI A13.1, "Scheme for the Identification of Piping Systems."
- C. Service marker:
 - 1. Interior: Brady Type B-946 Perma-Code Thin Film Pipe Markers.
 - 2. Exterior: Brady Type B-915 Snap-On, Brady Quik-Applied mechanically affixed with coated wire straps.
- D. Pipe banding tape with directional arrows:
 - 1. Interior: Brady Type B-500 vinyl coated cloth tape or Brady Type B-946 Perma-Code.
 - 2. Exterior: Brady Type B-915 Snap-On.

2.03 EQUIPMENT IDENTIFICATION:

- A. Equipment identification: Mark all equipment with the equipment numbers scheduled on Drawings. Use black phenolic tags with ½ inch high white engraved letters and numbers.
- B. Provide manufacturers name plate for each unit. All name plates shall be visible for owner's inspection.

2.04 VALVE IDENTIFICATION:

- A. Tag all valves with 1-1/2 in. round brass with 1/4 in. engraving of service and valve number.
- B. Provide a typewritten valve list framed behind glass and posted in the mechanical room, indicating valve type, service and tag number.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 INSTALLATION

- A. Install all identifications in accordance with manufacturer's instructions.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- C. Install tags with corrosion resistant chain.

END OF SECTION

SECTION 221005 - PLUMBING PIPING

PART 1 GENERAL

1.01 GENERAL PROVISIONS

- A. Provisions specified in Section 22 05 10, Plumbing Basic Mechanical Requirements and Methods, apply to all work of Division 22.

1.02 SECTION INCLUDES

- A. This Section prescribes basic materials and execution methods to be utilized for work of all Sections of Division 22.
- B. Products in Part 2.00 of this Section list generic names followed by specific requirements. References to generic names in other Sections of Division 22 shall be construed to mean the products specified in this Section.
- C. Complete piping for:
 - 1. Below grade hot and chilled domestic water piping.
 - 2. Sanitary sewer, waste and vent systems.
 - a. Connections to utilities.
 - b. Waste, vent, and indirect drain from all fixtures and equipment as required for complete operating systems.
 - c. Traps for connections to equipment specified in other Sections.
 - d. Connections to fixtures and equipment furnished by Owner or under other Sections.
 - e. Indirect drain connections to fixtures and equipment furnished by Owner or under other Sections.
 - 3. Potable and non-potable water systems.
 - a. Connections to utilities.
 - b. Domestic and industrial (non-potable) water supply to all fixtures and equipment as required for complete operating systems.
 - c. Insulation as specified.
 - d. Sterilization of potable water systems.
 - e. Stops, supplies, and accessories for connections to equipment specified in other Sections.
 - f. Connections to all fixtures and equipment furnished by Owner or under other Sections.
 - 4. Natural gas
 - a. Connections to utilities.
 - b. Gas piping for plumbing, air conditioning, kitchen, and other equipment as indicated on Drawings or specified.

1.03 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating.
- B. Section 22 05 10 - Basic Plumbing Requirements and Methods.
- C. Section 22 05 16 (15122) - Expansion Fittings and Loops for Plumbing Piping.
- D. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- E. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- F. Section 22 07 10 - Plumbing Insulation.

PART 2 PRODUCTS

2.01 HOT WATER PIPING, BELOW GRADE

- A. Manufacturer:
 - 1. Perma Pipe
 - 2. Thermacor
 - 3. Thermal Pipe Systems

- B. Xtru-therm as manufactured by Perma Pipe/ Ric-Wil prefabricated and pre insulated piping system composed of straight sections only. Fittings, anchors and other accessories shall be factory-fabricated to job dimensions and designed to minimize the number of field welds, composed of integral sealed HDPE outer jacket, polyurethane foam insulation and steel carrier pipe, as herein specified. Each system layout shall be computer analyzed by the piping system manufacturer to determine stress on the carrier pipe and anticipated thermal movement of the service pipe. The system design shall be in strict conformance with ANSI B-31.1 latest edition.
1. Outer jacket: High density polyethylene (HDPE) compound, per ASTM D1248, Type 3, Class C.
 2. Insulation: Polyurethane foam with the following minimum characteristics: K Factor 0.14 Blue/hr. per sq ft. per F per in. at 73 degrees F. Density 2 pcf, closed cell - 90-95% in conformance with MIL-1-24172 and ASTM C591 completely filling the annular space between carrier pipe and jacketing. Minimum insulation shall be in accord with Table 1. Exposed insulation at unit ends shall be sealed with a factory applied vapor barrier.
 - a. To ensure no voids are present, all insulation shall be infrared inspected.
 - b. Visually checked prior to application of the protective jacket.
 3. Carrier Pipe: Internal piping shall be copper type K with silver brazed joints.
 4. Fittings: Fittings will conform to pipe type and will be silver brazed for pressure piping to straight lengths in pre- plant.
 5. Insulation of connector joints: After welding and testing, joints shall be insulated with insulation and jacketing materials furnished by manufacturer. The installer shall seal the field joint area with a heat shrinkable adhesive backed sleeve. Backfilling shall not begin until the heat shrink sleeve has cooled.
 6. Anchors: 1/4 in. thick steel plate prefabricated anchor is attached to internal pipe and sealed to pipe jacketing at locations shown on drawings.
 7. End seals: Manufacturers wishing to have their products approved as an equal on the project shall comply with the following: Supply to Engineer at submittal time, a letter of certification from an independent testing laboratory that their products have been tested approval under the following test criteria:
 - a. Casing and end seal testing and certification: Test and certification procedures shall demonstrate that casing and end seals are capable of resisting penetration of water into casing and insulation at 20 feet of head pressure, measured above the highest point of the test sample, subjected over the entire surface of 8 foot casing test sample for not less than 24 hours.

Nominal Pipe Size (in.)	Minimal Insulation Thickness (in)	Jacket size (in.)
1	1.345	4HDPE
1-1/4	1.17	4HDPE
1-1/2	1.05	4HDPE
2	1.81	6HDPE

- C. Provide steel sleeve for piping below or through footings of adequate size to accommodate the pre insulated conduit.
- D. Provide Link-Seal wall sleeves for penetration of water-sealed underground walls.

2.03 WASTE AND VENT PIPING, FITTINGS, AND TRAPS FROM FLOOR SINKS AND DRAINS RECEIVING BEVERAGE (CO2) WASTE

- A. Corrosion-resistant, flame-retardant polypropylene with thermal fusion system.

2.04 WASTE PIPING

- A. Above grade: Schedule 40 PVC.
- B. Below grade:
1. Inside and outside of building: Schedule 40 PVC.

- C. Piping from floor sinks and floor drains receiving waste carbonated beverage:
 - 1. Schedule 40 PVC.

2.05 VENT PIPING

- A. Above grade: Either of the following:
 - 1. Schedule 40 PVC.
- B. Below grade: Schedule 40 PVC.
- C. Piping from floor sinks and floor drains receiving waste carbonated beverage:
 - 1. Schedule 40 PVC.

2.06 INDIRECT DRAIN PIPING

- A. Schedule 40 PVC.

2.07 PUMP DISCHARGE (FORCED) PIPING

- A. Galvanized steel pipe and fittings.

2.08 STORM DRAIN PIPING

- A. Above grade: Service weight cast iron soil pipe and fittings.
- B. Below grade:
 - 1. Inside and outside of building: Service weight cast iron soil pipe and fittings.

2.09 WATER PIPING

- A. Above grade:
 - 1. CPVC Piping.
- B. Below grade:
 - 1. CPVC Piping.

2.10 GREASE DUCT AND HOOD WASHDOWN PIPING

- A. Type "K" (for underground) or Type "L" (for above ground) hard copper with soldered fittings and silver soldered joints. Do not use Type "M".
- B. For grease duct and hood washdown piping, use Type L hard copper with soldered fitting and soldered joints for outside grease duct enclosure and grease hood, and use Type 316 Schedule 40 stainless steel pipe/tube with Swagelok fitting inside grease duct.

2.11 FUEL (NATURAL) GAS PIPING

- A. Above grade: Schedule 40 black steel with welded joints and fittings
- B. Below grade: Factory coated schedule 40 black steel with wrapped welded joints and fittings

2.12 VALVES

- A. Shut off valves:
 - 1. Smaller than 4": Ball valves
 - 2. 4" and larger: Gate valve
- B. Throttling valves: Globe valves.

2.13 CONDUITS FOR REFRIGERANT, SYRUP AND CO2 PIPING

- A. Schedule 40 PVC conduit with PVC socket couplings, long sweep conduit bends, and solvent welded joints.
- B. Galvanized steel pull boxes with screwed-on covers.

2.14 PIPE HANGERS AND SUPPORTS

- A. General: Hangers and maximum hanger spacing shall conform to the following:
 - 1. Maximum Spacing Between hangers:

Pipe	Rod	Cast Iron	All Other	Metal Pipes	PVC/CPVC
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Size	Size	Pipe	Horizontal	Vertical	Horizontal
3/4	3/8	-	6 ft.	10 ft.	3. ft.
1	3/8	-	6 ft.	10 ft.	3. ft.
1-1/4	3/8	-	6 ft.	One Story	4. ft.
1-1/2	3/8	-	6 ft.	One Story	4. ft.
2	3/8	5 ft.	10 ft.	One Story	4. ft.
2-1/2	1/2	-	10 ft.	One Story	4. ft.
3	1/2	5 ft.	10 ft.	One Story	4. ft.

- B. Beam attachments: painted finish; B-Line Figure B3050, or Owner-approved equivalent by Secure Strut & Hanger Co. or Unistrut.
- C. Clevis hangers:
 - 1. Standard hanger for steel pipe: Painted finish B-Line Figure, or Owner-approved equivalent by Secure Strut & Hanger Co., Tolco or Unistrut.
 - 2. For copper pipe: Electro-galvanized plastic coated; B-Line Figure B3100C, or Owner-approved equivalent by Secure Strut & Hanger Co., Tolco or Unistrut.
 - 3. AWWA type for iron pipe; painted finish; B-Line Figure B3102, or Owner-approved equivalent by Secure Strut & Hanger Co., Tolco or Unistrut.
- D. Protection Shields:
 - 1. Insulated pipe: Thermal hanger shield: 360 degree insert of calcium silicate totally encased in sheet metal shield; pipe shields Model A2000 (chilled water) or A3000 (other lines), or equivalent by Uni-Grip on Insul-shield.
 - 2. Bare pipe: Felt isolator; B-Line figure B3195, or approved equivalent by Secure Strut & Hanger Co. or Unistrut.
- E. Sleeves and flashings:
 - 1. Exterior wall: Wade 3600 or Owner-approved equivalent by Link Seal.
 - 2. Interior wall: Pipe shields Model WFB-CS, or Owner-approved equivalent by Pipe Shields Inc.
 - 3. Waterproofed floor: Wade W-3600.
 - 4. Floors: Pipe shields Model DFB-CS or QDFB-CS.
 - 5. Furnish materials and coordinate installation for flashing and counter flashing roof penetrations for vents, pipe, drains, and ducts.
 - 6. Materials:
 - a. Sheet metal : 24 gauge minimum ASTM 525, Class G90.
 - b. Sheet lead: 4 pounds per square foot.
 - c. Stainless steel: Minimum 24 gauge.
 - d. Sheet copper: 16 oz. per square foot.
 - e. Vent stack fitting: Josam1830 or Jay R. Smith 1750.

2.15 MATERIALS - GENERAL

- A. All materials shall be new and the best of their respective kinds.
- B. Exposed finish trim, fittings, and pipe in finished rooms or spaces shall be chromium plated brass or be covered with chromium plated brass sleeves. Inside of cabinets exposed to view when doors are open shall be construed to be finished space.
- C. Provide valves with trim as recommended by manufacturer for service on which installed.
- D. Provide same type materials by one manufacturer throughout project.
- E. Standard lists of materials herein may include products not required for this project.

2.16 PIPE AND TUBE

- A. Steel pipe:
 - 1. ASTM A53 Grade B, seamless or electric resistance weld; ASTM A106 Grade B; or ASTM A120.

2. Black or galvanized as specified.
 3. Beveled ends (B.E.), grooved (G.), or threaded and coupled (T&C), as specified in the applicable Division 22 Sections.
- B. Cast iron soil pipe: In accord with current issue of standards of the Cast Iron Soil Pipe Institute. Bitumastic-coated.
1. Hub and spigot or No-Hub.
 2. Service weight.
- C. Polypropylene pipe: Flame-retardant polypropylene with thermal fusion system for joints; GSR FUSEAL or equivalent by Spirolite.
- D. Copper tube: ASTM B88, 20-ft. straight lengths, except provide soft temper in 60-ft. coils for underground work.
1. Type "K" except where Type "L" is specified.
 2. Hard temper except where soft temper is specified.
- E. Ductile iron: Bell and spigot, mechanical joint, ductile iron, cement lined, with neoprene gasket and galvanized bolts, Class 50, ANSI A21.51 and ANSI A21.4 bituminous exterior coating.
- F. Stainless steel pipe: 304 stainless steel seamless, fully annealed, ASTM A269 or A213 with threaded fittings.
- G. PVC pipe: Sch 40 and Sch 80 Type I, 160 psi at 73 deg. F, ASTM 1785 with solvent cement fittings. Solvent cement and purple cleaner shall be supplied by same manufacturer.
- H. CPVC pipe: Sch. 40 and Sch. 80, 230 psi at 73 deg. F, ASTM F441, with solvent cement fittings. Solvent cement and purple cleaner shall be supplied by same manufacturer.

2.17 FITTINGS

- A. Malleable iron fittings: Screwed, banded pattern, ASTM A197 and ANSI B16.3 - Crane, or equivalent by Walworth, Grinnel, or Stockham.
1. Standard 150 lb. or extra heavy 300 lb. as specified.
 2. Black or galvanized as specified.
- B. Malleable iron unions: Screwed, - Crane, or equivalent by Walworth, Grinnel, or Stockham.
1. Standard 150 lb. or extra heavy 300 lb. as specified for fittings.
 2. Black or galvanized as specified.
 3. Provide dielectric unions where connecting pipe of dissimilar metals.
- C. Cast iron fittings: Screwed - Crane, or equivalent by Walworth, Grinnel, or Stockham.
1. Standard 125 lb. or extra heavy 250 lb. as specified.
 2. Black unless galvanized is specified.
- D. Screwed flanges: Cast iron or steel, raised face - Crane, or equivalent by Walworth, Grinnel, Stockham, Tube Turn, Ladish, or Taylor Forge.
1. Where steel is specified, use only steel.
 2. Standard cast iron 125 lb. or steel 150 lb. Extra heavy cast iron 250 lb. or steel 300 lb. as specified for fittings.
 3. Cast iron plain, steel black enamel, unless specified as galvanized.
 4. Drilling to match mating flange on valve or equipment.
- E. Welding flanges: Steel, weld neck or slip on, black enamel, raised face - Tube Turn, or equivalent by Ladish or Taylor Forge.
1. Standard 150 lb. or extra heavy 300 lb. as specified for fittings.
 2. Drilling to match mating flange on valve or equipment.
 3. Slip on flanges shall be welded inside with at least one pass in addition to full fillet weld outside.
- F. Flange gaskets: 1/8 in. thick, composition, unless specified otherwise - Garlock, or equivalent by Crane. Asbestos type gaskets are not approved.
- G. Flange bolting materials: Carbon steel heavy hex bolts and nuts, ASTM A307, Type B.

- H. Welding fittings: Factory-formed, steel plate or steel tube, beveled end, prime coat or enameled - Tube Turn, or equivalent by Ladish or Taylor Forge.
 - 1. 2 in. and smaller: 3000 lb., forged steel, socket weld, ASTM A105, Grade 2, and ANSI B16.11.
 - 2. 2-1/2 in. and larger: Seamless steel, full pattern, long radius, butt weld, ASTM A234 and ANSI B16.9.
- I. Cast iron soil pipe fittings: In accord with current issue of Standards of the Cast Iron Soil Pipe Institute. Bitumastic-coated.
 - 1. Hub and spigot or No-Hub.
 - 2. Service weight.
 - 3. No-Hub couplings:
 - a. Cast iron mechanical (MG) couplings, installed with torque wrench to 175 in. lb.
 - b. Stainless steel band type No-Hub couplings equal to Clamp All XXHD type may be used above grade only.
 - c. Hub gaskets: Neoprene Double "O" ring type equal to American Foundry "Dual Tite."
- J. Polypropylene fittings: Flame-retardant polypropylene with thermal fusion system for joints; GSR FUSEAL or equivalent by Spirolite.
- K. Solder fittings: Cast brass or wrought copper ANSI B16.22 solder joint type - Nibco, or equivalent by Grinnel. Cast bronze fittings ANSI B116.18 may be used only in sizes not manufactured in wrought copper.
- L. Ductile Iron fittings: Ductile iron, cement lined, AWWA Class 250, ANSI A21.10, bell and spigot; mechanical restrained joint with neoprene gaskets and galvanized bolts, MegaLug or equivalent by US Pipe or American.
- M. Grooved couplings: Mechanical couplings requiring a machined groove on pipe with suitable gaskets for service on which installed - Victaulic, or equivalent by Gruvlok.
- N. Stainless steel pipe fittings: Fittings shall be threaded type ASTM A269 or A213.

2.18 VALVES

- A. Quality Assurance
 - 1. Boiler valves: ASME Boiler Code Specifications.
 - 2. Valve bodies, shells, and seats: Factory tested.
 - 3. Bronze body valves:
 - a. Materials for pressure containing parts: ASTM B-62 (less than 200 psi), B-61 (200 psi and above).
 - b. Design, workmanship, testing: MSS-SP-80.
 - 4. Iron body valves:
 - a. Materials for pressure containing parts: ASTM A126, Grade B.
 - b. Face-to-face and end-to-end dimensions: ANSI B16.10.
 - c. Design, workmanship, testing: MSS-SP-70, 71.
 - 5. Butterfly valves:
 - a. Face-to-face and end-to-end dimensions: MSS-SP-67.
 - 6. Valve stems: ASTM B584, Class 13C (cast silicon brass).
 - 7. Pressure castings: Free of impregnating materials.
 - 8. Valve name or trademark and working pressure stamped or cast into body.
 - 9. Standard for 200 psi and 300 psi valves with metallic seats: ASTM B61.
- B. Gate valves:
 - 1. Class 125/150 WOG:
 - a. Threaded or solder ends: Class 150; bronze; screw-in bonnet; non-rising stem; resilient wedge; NIBCO T-113 or S-113, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
 - b. Flanged ends: Class 125; iron body; bolted bonnet; non-rising stem; resilient wedge; bronze mounted; NIBCO F-619, or Owner-approved equivalent by Crane, Stockham, or Jenkins.

2. Class 300 WOG:
 - a. Threaded ends: Class 300; bronze block pattern; union bonnet; non-rising stem; alloy solid wedge; NIBCO T-176-SS, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
 - b. Flanged ends: Class 300; cast steel; raised face flanges; bolted bonnet; outside screw and yoke; flexible wedge; universal trim.
- C. AWWA gate valves:
 1. 2-1/2 in. and smaller: 200 psi; iron body; bronze mounted; non-rising stem; flanged type; O-ring seal; 2 in. square wrench nut; Clow 6100, or Owner-approved equivalent by Mueller.
 2. 3 in. and larger: 200 psi; iron body; bronze mounted; resilient wedge; non-rising stem; mechanical joint type; O-ring seal; 2 in. square wrench nut; set screw locking gland; Clow 6100, or Owner-approved equivalent by Mueller.
 3. Provide extension stem to 6 in below final grade and valve box. Valve box shall be cast iron; two-piece; buffalo type; 5-1/4 in. shaft; screw type; with lid marked "water"; by Alhambra or Bingham & Taylor.
- D. OS&Y gate valves:
 1. Above grade: Flanged, 175 lb. iron body; bolted bonnet; outside screw and yoke; solid wedge; NIBCO F-607-0, or Owner-approved equivalent by Kennedy or Mueller.
 2. Below grade: Mechanical joint, 175 lb. iron body; bolted bonnet; indicator post pattern with non-rising stem; solid wedge; NIBCO M-609, or Owner-approved equivalent by Kennedy or Mueller.
 3. Valves shall be UL-listed and FM-approved.
- E. Globe valves:
 1. Class 125/150 WOG:
 - a. Threaded or solder ends: Class 150; bronze; screw-in bonnet; integral seat; renewable discs; NIBCO T-211 or S-211, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
 - b. Flanged ends: Class 125; iron body; bolted bonnet; renewable seat and disc; bronze mounted; NIBCO F-718-B, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
 2. Class 300 WOG:
 - a. Threaded ends: Class 300; bronze; union bonnet; integral seat; renewable discs; NIBCO T-275, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
 - b. Flanged ends: Class 250; cast steel; raised face flanges; bolted bonnet; outside screw and yoke; universal trim.
- F. Check valves:
 1. Class 125/150 (swing type):
 - a. Threaded or solder ends: Class 125; bronze; horizontal swing; regrinding type; Y-pattern; renewable discs; NIBCO T-413 or S-413, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
 - b. Flanged ends: Class 125; iron body; bolted bonnet; horizontal swing; renewable seat and disc; NIBCO F-918, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
 2. Class 300 WOG (swing type):
 - a. Threaded ends: Class 300; bronze; horizontal swing, regrinding type; Y-pattern; renewable discs; NIBCO T-473, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
 - b. Flanged ends: Class 300; cast steel; raised face flanges; bolted bonnet; outside screw and yoke; universal trim.
 3. Class 125 WOG (non-slam):
 - a. Wafer type: Class 125; cast iron; double door; resilient seated; spring closing; Apco series 9000, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
 4. Class 250 WOG (non-slam):

- a. Wafer type: Class 250; cast iron; double door; resilient seated; spring closing; Apco series 9000, or Owner-approved equivalent by Crane, Stockham, or Jenkins.
- G. Gas cocks:
 - 1. Medium and high pressure: 200 CWP; iron plug valve; two-bolt cover; short pattern; wrench operated; 2 in. and smaller, Rockwell Nordstrom Figure 142 (threaded ends); 2-1/2 in. and larger, Figure 143 (flanged ends).
 - 2. Low pressure: 2 in. and smaller, 125 psi, bronze cock, square head, Crane No. 250; 2-1/2 in. and larger, same as medium and high pressure.
- H. Butterfly valves: 200 psi; ductile iron body; geometric drive; molded-in seat liner, lug type; NIBCO LD-2010-3 or Owner-approved equivalent by Crane or Grinnell (2 in. to 6 in.), NIBCO LD-2000-5, or Owner-approved equivalent by Crane or Grinnell (for 8 in. to 12 in.); 150 psi; ductile iron body, gear drive, molded-in seat liner, lug type, NIBCO LD-0010-5, or Owner-approved equivalent by Crane or Grinnell (for 14 in. to 16 in.).
- I. Balancing cocks: Same as specified for low pressure gas cocks.
- J. Balancing valves:
 - 1. Provide calibrated non-ferrous valve with differential pressure taps for meter connections including built-in screwed and cast iron flanges check valves and stainless steel strainer.
 - 2. Preset flow control valve: Provide with stainless steel flow control cartridge which can be removed and replaced without breaking piping connections.
 - 3. Manual flow control valve: Include integral pointer indicating valve opening position with a tamper-proof memory feature, venturi type.
 - 4. Manufacturers: Griswold, Armstrong, Bell & Gossett, Taco.
- K. Ball valves (except for compressed air):
 - 1. Class 125/300 WOG:
 - a. 2 in. and smaller: Threaded or solder ends; 125 psi; two-piece bronze body; conventional port; bronze trim; blowout proof stem; Teflon seats and seals; NIBCO T-580 or S-580, or Owner-approved equivalent by Crane, Grinnell, or Apollo.

PART 3 EXECUTION

3.01 INSTALLATION

- B. It is intended that workmanship be the best standard practice of each trade.
- C. Run piping parallel to building construction.
- D. Unless detailed otherwise or specifically approved in writing by Owner, conceal all piping in walls, partitions, ceilings or furred spaces.
- E. Properly support all equipment and piping from main structural members. Provide secondary structural framing as required. Do not hang equipment or piping directly from slabs or decks.
- F. Properly pitch all piping for proper drainage.
- G. Isolate all piping from building structure.
- H. Where exterior watering piping is required, pipe shall be insulated and have metal insulation jacket.
- I. Properly wrap all copper and steel pipe and fittings below grade.
- J. Make up connections between piping of dissimilar metals with approved dielectric couplings.
- K. Do not permanently close-up, furr-in, or cover-over completed piping runs until they have been inspected and approved.
- L. Install exposed polished or enamel trim connections at fixtures with special care free from tool marks and exposed threads at fittings.
- M. Use reducing/increasing fittings where a change in pipe size occurs in a run.
- N. Bushings of any type are not permitted, except for insertion of the thermometers or gauges.

- O. Unless specifically specified or detailed otherwise, only cast iron soil pipe will be permitted be run beneath floor slabs on grade.
- P. Clean inside of pipe before installing it. Keep installed piping clean, and protect ends from foreign matter by capping or plugging them.
- Q. Install pipe so that it does not interfere with the opening of doors or apparatus, access to equipment, or to electrical equipment.
- R. Do not install pipes in such a way that they will appear torque to pumps. After pumps have been installed, and pumps have been operated, recheck and realign pumps if necessary.
- S. Do not install water pipes through electrical rooms, power electronic rooms, electrical equipment rooms, tele/data rooms, , or audio/visual rooms.
- T. Do not install piping above electrical equipment, such as starters, variable frequency drives, motor control centers, or disconnects.
- U. Provide flanges and unions throughout the pipe systems at all equipment. Make provisions for servicing and removal of equipment without dismantling piping.
- V. Piping passing through or under grade beams or through foundation walls shall be provided with a schedule 40 steel pipe sleeve two sizes greater than the pipes passing through the sleeves.
- W. Steel pipe, screwed: Cut threads straight and true and properly ream burrs for free-flow. Apply Crane Thread Lubricant, Grinnel Figure 1698 or WKM "Key-Tite." Leave not more than two threads exposed after joints are made up.
- X. All gas piping shall be connected to equipment and fixtures with FM approved flexible connectors.
- Y. Steel pipe, welded:
 - 1. Make continuous welds with electric arc process in accord with recommendations of ASTM Section IX for welder' s qualifications and the applicable sections of ANSI B31 for type of service.
 - 2. Properly bevel and clean joints before making welds.
 - 3. All welds shall be made by a qualified welder.
 - 4. Use factory-formed fittings or Weld-O-Lets for all changes in direction and branch connections.
- Z. Steel and cast iron pipe, mechanical and/or gasketed joints: All piping joints shall be groove couplings, gasketed bell and spigot joints. No-Hub soil pipe band joints, or other mechanical joints shall be made up in accord with manufacturer's recommendations.
- AA. Plastic pipe:
 - 1. All plastic pipe shall be joined with proper fittings. Solvent or fusion weld to pipe in accord with manufacturer's recommendations.
- AB. Copper Tube:
 - 1. Make all connections and changes of direction with factory fittings, except that tubing may be bent to a radius not less than three times the pipe diameter provided that bends are made using proper bending tools and no appreciable flattening or distortion of tube results.
 - 2. Cut tube with a tubing cutter. Ream and clean ends to a bright finish. Clean inside of fitting sockets to a bright finish.
 - 3. Make-up solder joints with appropriate paste flux and solder with 95/5 solder, unless specified otherwise.
 - 4. Make-up silver solder (brazed) joints with appropriate flux and silver solder with silver brazing alloy.
- AC. Valves
 - 1. Install shut off valves on all except waste and vent, in the following locations:
 - a. Mains entering or leaving building.
 - b. All Major branch runs such as branches serving a floor, a wing, or a major section of a building.

- c. All equipment connections.
 - d. Other locations as may be indicated on Drawings.
- 2. Install balancing valves as indicated on Drawings and as required for proper balancing of the various systems.
- 3. All valves shall be line size.
- AD. Strainers, air vents, and valved drains:
 - 1. Strainers: Install strainers at the inlet of all pumps, automatic valves, pressure regulators, steam traps and as may be indicated on Drawings..
 - 2. Air vents: Install air vents at high points of all steam and water piping systems as required for proper system operation, and at any other locations as may be indicated on Drawings.
- AE. Valved drains: Install valved drains at low points in piping runs as required for complete system drainage, at all strainer blow-off connections, at at other locations as may be indicated on Drawings.
 - 1. Provide valved drains at all equipment that is not otherwise self-draining through the piping system.
- AF. Unions: Install unions at all equipment connections, on both sides of all automatic views, at steam traps, at regulator and at other locations as may be indicated on Drawings. Flanges or reassemble able mechanical joints may be substituted for unions where these types of joints are otherwise permitted.
- AG. Drain Pans: Provide 16 gauge galvanized sheet metal drain pans below pipes conducting liquids of any kind as indicated on Drawings.
 - 1. Pane shall be 2 1/2 in. deep and reinforced with angle iron frame. Support and brace pans as required.
 - 2. Run 3/4 in. copper drain to waste receptor.
- AH. Underground pipe system coating
 - 1. Protect all underground copper and steel piping as follows, unless specified otherwise; and other foreign materials. All sharp points shall be removed.
 - a. Use Hexane, Toluol, Toluene, Xylol. Do not use oil-based solvents for cleaning.
 - b. Priming: Use JM No. 22 primer to obtain the maximum coating bond to pipe and also to act as a filter for flawed coating surfaces.
 - 2. Coating application:
 - a. Mechanically spirally apply tape wrap. The overlap of each spiral layer shall be a minimum of 1/2 the width of he tape used.
 - b. Field joints - tees and fittings: Hand wrap field joints over clean surfaces with tape wrapping extending from 2 in to 6 in over existing pipe coating, depending on the pipe diameter.
 - c. Testing of coated pipe: User approved holiday detector and test the coating integrity of all piping system. Set test voltage at 7500V.
 - 1) Repair all "leaks" in manner as specified for original coating.
 - 3. Corrosion protection: All buried uncoated and/or otherwise unprotected valves, clamps, flanges, bolts, nuts, etc. shall be cleaned, primed, and coated with epoxy mastic equivalent to Carboline 890 or Carbomastic 15 Low Odor. Apply in accord with manufacturer's instructions.
- AI. Sleeves and escutcheons:
 - 1. Sleeves:
 - a. Provide sleeves for all pipes passing through floors, walls and ceilings. Extend sleeves 2 in. above floors. Make sleeves flush with walls and ceilings.
 - b. At concrete construction, set sleeves, or Owner-approved equivalent, for penetration of underground walls.
 - c. Provide Link Seal wall sleeves, or Owner-approved equivalent, for penetration of underground walls.

- 1) Escutcheons: Provide chrome-plated hinged escutcheon with set screws at each exposed pipe passing through a wall, floor, or ceiling in finished portions of the building.
- 2) Escutcheons Shall be Beacon or equal No. 13 for pipe sizes through 6in. and Beacon or equal No. 3 for pipe sizes larger than 6 in. Where piping insulated, escutcheons shall fit around outside of insulation.

AJ. Openings:

1. Except where specifically indicated on Drawings, openings for piping for equipment will not be allowed in any structural members without written consent of Owner. For openings through concrete construction, install sleeves in forms before concrete is placed.
2. In the event additional openings are required through structural members, or notching, boring or cutting of the structure is necessary, perform the work as directed in writing by Owner.
3. Include all costs for cutting of holes required for installation of work.

AK. Waterproofing: Make absolutely watertight all openings through waterproofed construction caused by the penetration of mechanical work.

AL. Thrust / support blocks: Provide thrust blocks at vertical and horizontal underground pipe locations, such as branch tees, directional changes, and where required to prevent the separation of mechanical type pipe joints in accord with recommendations of AWWA and DIPRA (Ductile Iron Pipe Research Association).

AM. Pipe detection tracing:

1. Provide wire tracing for all underground non-metallic piping systems.
2. Copper tracer wire shall be #14 AWG solid, single conductor, insulated copper wire. Place in pipe trench above the pipe at maximum depth of 3ft. Do not secure to the pipe.
3. Terminate at each building near pipe entrance. Rise through conduit to weatherproof junction box mounted on building wall. Label box "Tracer Wire" with name of service.

AN. Sterilizing potable water systems

1. Notify Water Department and Owner 24 hr. in advance of pressure testing or chlorination.
2. Sterilize (chlorinate) all new potable water systems and portions of existing systems subjected to contamination during major renovations.
 - a. Use potable water for all testing.
 - b. Provide all equipment and materials required for the chlorination and testing.
 - c. Provide suitable connections for injection of the chlorine solution.
 - d. Provide adequate flush points for flushing and chlorination.
 - e. Thoroughly flush the system before chlorination.
 - f. Chlorinate to a 50 ppm chlorine residual, and hold the residual in the system for 24 hours.
 - g. After the 24-hr. contact time and upon authorization from Water Department and Owner, flush system to water supply chlorine residual.
 - h. Water Department and/or Owner will draw samples and obtain bacteriological analysis. Should samples prove unsatisfactory, repeat chlorination procedure.
 - i. Water Department, upon satisfactory completion of chlorination, will turn on water in presence of Contractor.

AO. Below ground piping installation: In accord with manufacturer's recommendations

AP. All branch take-offs shall be from the top of water main run.

3.02 SERVICE CONNECTIONS

- A. Provide proper adapter where size and/or material of site utility is different at point of connection.
- B. Provide all required pipe offsets in direction and elevation to properly connect to utility mains at point of connection.
- C. Make connections to utility mains as indicated and as required for a complete operating system, including all concrete cutting and patching.

3.03 SEISMIC BRACING AND ANCHORAGE

- A. Seismic bracing and anchorage of piping shall be done in accord with "Guidelines for Seismic Restraining of Mechanical Systems," latest edition, published by SMACNA, and in compliance with local codes.

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES

PART 1 GENERAL

1.01 GENERAL PROVISIONS

- A. Provisions specified in Section 22 05 10, Plumbing Basic Mechanical Requirements and Methods, apply to all work of Division 22.

1.02 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Electric water coolers.
- F. Drinking fountains.
- G. Showers.

1.03 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealers: Seal fixtures to walls and floors.
- B. Section 22 05 10 - Basic Plumbing Requirements and Methods.
- D. Section 22 10 05 - Plumbing Piping.

1.04 REFERENCE STANDARDS

- A. ANSI Z124.2 - American National Standard for Plastic Shower Units; 1995.
- B. ANSI Z124.1.2 - American National Standard for Plastic Bathtub and Shower Units; 2005.
- C. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2004.
- D. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration Systems; 2006.
- E. ARI 1010 - Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers; Air-Conditioning and Refrigeration Institute; 2002.
- F. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).
- G. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2005.
- H. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 1994 (R2004).
- I. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers; 2008.
- J. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2008.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

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

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 PLUMBING FIXTURES

- A. See Construction Documents.

2.02 CARRIERS AND BACKING

- A. Carriers: Wade, Zurn, or Smith of type suitable for proper fixture installation.
- B. Backing: 1/4 in. x 6 in. steel plate set horizontally and firmly attached to three studs minimum for backing at all wall hung fixtures and accessories except where carriers are specified.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Mount fixtures at heights indicated on Architectural Drawings.
- B. At sinks, lavatories, and other pairs of faucets, install the cold water faucet on the right side, and install the hot water faucet on the left side.
- C. Where sinks and lavatories are specified to be mounted in countertops, closely coordinate the work of this Section with that of the other trade Sections affected for correct cutting of countertops and backsplashes to receive plumbing fixtures and trim.
- D. Securely fasten all carriers to floor construction to prevent overturning.
- E. Use fittings with fastening ears to anchor water piping to structure at fixture locations.
- F. Smoothly grout joints between fixtures and floor or wall with G.E. Silicone Grout No. 1702.
- G. Insulate exposed water supply and drain piping on all handicap lavatories with series 100 white Handi Lav-Guard insulation kit by Truebro Inc., Ellington CT, or Owner-approved equivalent by Plumber Specialty Products, Inc.
- H. Provide plumbing fixtures, trim and related items such as supplies, traps, drains, cleanouts, water closet flanges, bolts, seats and covers, fixture supports and other accessory items.
- I. Coordinate fixture requirements by reviewing architectural, structural, and equipment drawings. Install fixtures in accordance with Contract Drawings and manufacturer's rough-in drawings. Coordinate dimensions required for minimum fixture clearances with other Divisions
- J. Perform work in accordance with applicable codes and standards enforced by local authorities.
- K. Where automatic electronic flushing devices are specified, coordinate installation with Division 26.
- L. All wall penetrations through finished walls are to be caulked water tight at all wet locations
- M. Coordinate dimensions required for minimum fixture clearances with other Divisions.
- N. Provide outlet devices which limit the flow of hot water to lavatories and sinks to a minimum of 0.5 GPM, sized as recommended by the manufacturer and as required under ASHRAE Standard 90-75, paragraph 7.7.2 or local or state energy codes.
- O. Provide deep seal traps under floor drains in toilet rooms, mechanical rooms, and elsewhere as indicated on drawings.
- P. Connect wall hung urinals to waste piping with red brass nipples.
- Q. Provide cast iron p-traps under floor drains.

- R. Install barrier free fixtures in accordance with rules and regulations of the Americans with Disabilities Act (ADA).
- S. Provide 12" minimum access to fixtures with slip-joint connections.

3.02 TESTING

- A. Inspect and test all work to insure that it is installed in accordance with drawings and specification and is functioning as designed. Test procedures and pressure as required by other sections.
- B. Correct all deficiencies found and retest.

3.03 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace damaged products before Date of Substantial Completion.
- C. Do not permit use of fixtures.

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

1.02 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Champion America, Inc: www.Champion-America.com.
- C. Seton Identification Products: www.seton.com/aec.
- D. Substitutions: Not permitted.

2.02 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.

2.03 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
 - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.

3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
 6. Ductwork and Equipment: 2-1/2 inch high letters.
- B. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors conforming to ASME A13.1.

2.05 PIPE MARKERS

- A. Color: Conform to ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.06 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
 1. HVAC Equipment: Yellow.
 2. Fire Dampers and Smoke Dampers: Red.
 3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 09 90 00.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- G. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- H. Identify control panels and major control components outside panels with plastic nameplates.
- I. Identify thermostats relating to terminal boxes or valves with nameplates.
- J. Identify valves in main and branch piping with tags.
- K. Identify air terminal units and radiator valves with numbered tags.
- L. Tag automatic controls, instruments, and relays. Key to control schematic.

- M. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- N. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- O. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 230593 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic, steam, and refrigerating systems.
- C. Measurement of final operating condition of HVAC systems.
- D. Sound measurement of equipment operating conditions.
- E. Vibration measurement of equipment operating conditions.
- F. Commissioning activities.

1.02 RELATED REQUIREMENTS

- A. Not Applicable.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Not Applicable.

1.04 REFERENCE STANDARDS

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to the Construction Manager.
 - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
 - 3. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Identification and types of measurement instruments to be used and their most recent calibration date.
 - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - e. Final test report forms to be used.
 - f. Detailed step-by-step procedures for TAB work for each system and issue, including:
 - 1) Terminal flow calibration (for each terminal type).
 - 2) Diffuser proportioning.
 - 3) Branch/submain proportioning.
 - 4) Total flow calculations.
 - 5) Rechecking.
 - 6) Diversity issues.

- g. Expected problems and solutions, etc.
 - h. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.
 - j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
 - k. Confirmation of understanding of the outside air ventilation criteria under all conditions.
 - l. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
 - m. Method of checking building static and exhaust fan and/or relief damper capacity.
 - n. Proposed selection points for sound measurements and sound measurement methods.
 - o. Methods for making coil or other system plant capacity measurements, if specified.
 - p. Time schedule for TAB work to be done in phases (by floor, etc.).
 - q. Description of TAB work for areas to be built out later, if any.
 - r. Time schedule for deferred or seasonal TAB work, if specified.
 - t. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
 - u. Interstitial cavity differential pressure measurements and calculations, if specified.
 - v. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
 - w. Procedures for formal progress reports, including scope and frequency.
 - x. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Field Logs: Submit at least once a week to Construction Manager.
- E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- F. Progress Reports.
- G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- 1. Submit under provisions of Section 01 40 00.
 - 2. Submit to the Construction Manager within two weeks after completion of testing, adjusting, and balancing.
 - 3. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 4. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 5. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 - 6. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 7. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 8. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
 - 9. Test Reports: Indicate data on AABC MN-1 forms. Submit data in SI (metric) units.
 - 10. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.

- f. Project Architect.
- g. Project Engineer.
- h. Project Contractor.
- i. Report date.

- H. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.06 QUALITY ASSURANCE

- A. TAB Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC.
- B. Perform Work under supervision of AABC Certified Test and Balance Engineer experienced in performance of this Work and licensed in the State in which the Project is located.

1.07 PRE-BALANCING MEETING

- A. Convene a meeting one week prior to commencing work of this Section.

1.08 SEQUENCING AND SCHEDULING

- A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.
- B. Schedule and provide assistance in final adjustment and test of smoke control system with Fire Authority.

1.09 WARRANTY

- A. Furnish AABC National Performance Guaranty for this project.

PART 2 EXECUTION

2.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Air coil fins are cleaned and combed.
 - 8. Access doors are closed and duct end caps are in place.
 - 9. Air outlets are installed and connected.
 - 10. Duct system leakage is minimized.
 - 11. Hydronic systems are flushed, filled, and vented.
 - 12. Pumps are rotating correctly.
 - 13. Proper strainer baskets are clean and in place.
 - 14. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

- C. Beginning of work means acceptance of existing conditions.

2.03 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Engineer to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

2.04 ADJUSTMENT TOLERANCES

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

2.05 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- H. Check and adjust systems approximately six months after final acceptance and submit report.

2.06 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

2.07 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

2.08 COMMISSIONING

- A. See Sections 01 91 13 and 23 08 00 for additional requirements.
- B. Perform prerequisites prior to starting commissioning activities.
- C. Fill out Prefunctional Checklists for:
 - 1. Air side systems.
 - 2. Water side systems.
- D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.
- E. Re-check a random sample equivalent to 10 percent of the final TAB report data as directed by Commissioning Authority.
 - 1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
 - 2. Use the same test instruments as used in the original TAB work.
 - 3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
 - 4. For purposes of re-check, failure is defined as follows:
 - a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
 - b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
 - c. Temperatures: Deviation of more than one degree F.
 - d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
 - e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.

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

2.09 SCOPE

- A. Test, adjust, and balance the following:
1. Air Cooled Refrigerant Condensers
 2. Packaged Roof Top Heating/Cooling Units
 3. Packaged Terminal Air Conditioning Units
 4. Computer Room Air Conditioning Units
 5. Air Coils
 6. Air Handling Units
 7. Fans
 8. Air Filters
 9. Air Inlets and Outlets

2.10 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
1. Manufacturer
 2. Model/Frame
 3. HP/BHP
 4. Phase, voltage, amperage; nameplate, actual, no load
 5. RPM
 6. Service factor
 7. Starter size, rating, heater elements
 8. Sheave Make/Size/Bore
- B. V-Belt Drives:
1. Identification/location
 2. Required driven RPM
 3. Driven sheave, diameter and RPM
 4. Belt, size and quantity
 5. Motor sheave diameter and RPM
 6. Center to center distance, maximum, minimum, and actual
- D. Combustion Equipment:
1. Boiler manufacturer
 2. Model number
 3. Serial number
 4. Firing rate
 5. Overfire draft

6. Gas meter timing dial size
 7. Gas meter time per revolution
 8. Gas pressure at meter outlet
 9. Gas flow rate
 10. Heat input
 11. Burner manifold gas pressure
 12. Ambient temperature
- E. Air Cooled Condensers:
1. Identification/number
 2. Location
 3. Manufacturer
 4. Model number
 5. Serial number
 6. Entering DB air temperature, design and actual
 7. Leaving DB air temperature, design and actual
 8. Number of compressors
- F. Cooling Coils:
1. Identification/number
 2. Location
 3. Service
 4. Manufacturer
 5. Air flow, design and actual
 6. Entering air DB temperature, design and actual
 7. Entering air WB temperature, design and actual
 8. Leaving air DB temperature, design and actual
 9. Leaving air WB temperature, design and actual
 14. Saturated suction temperature, design and actual
 15. Air pressure drop, design and actual
- G. Heating Coils:
1. Identification/number
 2. Location
 3. Service
 4. Manufacturer
 5. Air flow, design and actual
 10. Entering air temperature, design and actual
 11. Leaving air temperature, design and actual
 12. Air pressure drop, design and actual
- H. Return Air/Outside Air:
1. Identification/location
 2. Design air flow
 3. Actual air flow
 4. Design return air flow
 5. Actual return air flow
 6. Design outside air flow
 7. Actual outside air flow
 8. Return air temperature
 9. Outside air temperature
 10. Required mixed air temperature
 11. Actual mixed air temperature
 12. Design outside/return air ratio
 13. Actual outside/return air ratio
- I. Exhaust Fans:

1. Location
 2. Manufacturer
 3. Model number
 4. Serial number
 5. Air flow, specified and actual
 6. Total static pressure (total external), specified and actual
 7. Inlet pressure
 8. Discharge pressure
 9. Sheave Make/Size/Bore
 10. Number of Belts/Make/Size
 11. Fan RPM
- J. Duct Traverses:
1. System zone/branch
 2. Duct size
 3. Area
 4. Design velocity
 5. Design air flow
 6. Test velocity
 7. Test air flow
 8. Duct static pressure
 9. Air temperature
 10. Air correction factor
- K. Duct Leak Tests:
1. Description of ductwork under test
 2. Duct design operating pressure
 3. Duct design test static pressure
 4. Duct capacity, air flow
 5. Maximum allowable leakage duct capacity times leak factor
 6. Test apparatus
 - a. Blower
 - b. Orifice, tube size
 - c. Orifice size
 - d. Calibrated
 7. Test static pressure
 8. Test orifice differential pressure
 9. Leakage
- M. Flow Measuring Stations:
1. Identification/number
 2. Location
 3. Size
 4. Manufacturer
 5. Model number
 6. Serial number
 7. Design Flow rate
 8. Design pressure drop
 9. Actual/final pressure drop
 10. Actual/final flow rate
 11. Station calibrated setting

END OF SECTION

3.02 DUCT INSULATION

- A. Provide insulation for the following:
 - 1. All supply air ductwork, except where lined ductwork is indicated on Drawings. Refer to Section 23 31 00 for duct lining specifications.
 - 2. All unlined return air ductwork in non-conditioned spaces.
 - 3. All outside air intake ductwork to air delivery equipment where outside air duct passes through a conditioned space or a return/relief air plenum.
 - 4. Other ducts where specifically noted on Drawings.
- B. Indoor ducts:
 - 1. Concealed ducts: Install blanket insulation tight and smooth. Secure to ducts having long sides or diameters as follows:
 - a. Smaller than 24 in.: Class 2 bonding adhesive applied in 6-in.-wide transverse strips on 12-in. centers.
 - b. 24 in. and larger: Anchor pins spaced 12 in. apart each way. Apply bonding adhesive to prevent sagging of the insulation.
 - c. Overlap joints 3 in.
 - d. Seal joints, breaks, and punctures with vapor barrier compound.
 - e. Insulation on exposed ducts shall be secured in place with adhesive and insulation pins, and cover the entire assembly with 8 oz. canvas pasted in place.
 - 1) Fit all corners of ducts in equipment rooms with metal angles before canvas is applied.
- C. Insulation omitted: Do not insulate any of the lined ductwork exposed to outdoors and any of indoor exhaust air ductwork unless indicated otherwise on Drawings or specified.

3.03 PLENUM INSULATION

- A. Internally insulate in field all accessible plenums as specified for duct lining in Section 23 3100.

3.04 TANK AND HEAT EXCHANGER INSULATION

- A. Insulate all tanks over 100°F operating temperature, and all heat exchangers. Wire calcium silicate blocks in place securely with 14 gauge annealed steel wire. Cover with 1 in. mesh chicken wire and 1/4 in. minimum thickness of plaster. Paste canvas jacket neatly in place and size ready for painting.
 - 1. Boilers and chillers are considered as heat exchangers and shall be field insulated unless equivalent factory insulation has been provided.

3.05 BOILER AND WATER HEATER STACK AND FLUES

- A. Insulate all boiler and water heater stacks, flues, breechings, and flue connectors as specified for tanks and heat exchangers.
 - 1. Insulation may be omitted on double wall water heater flues and on water heater flue connectors.

3.07 WEATHERPROOFING

- A. Weatherproof all insulation exposed to outdoor or excessive moisture, and elsewhere as indicated. Install aluminum jacket in accord with manufacturer's instructions.

3.08 PROTECTIVE COVERING

- A. Install aluminum jacket (same as specified for weather protection) on all exposed insulation within 6 ft. of floor or grade, to protect insulation from physical damage.

END OF SECTION

SECTION 230713 - DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct Liner.
- C. Insulation jackets.

1.02 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating: Painting insulation jackets.
- B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- C. Section 23 31 00 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.
- B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate Metric; 2007.
- C. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.
- D. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2008.
- E. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2009.
- F. ASTM C 916 - Standard Specification for Adhesives for Duct Thermal Insulation; 1985 (Reapproved 2007).
- G. ASTM C 1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2005.
- H. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.
- I. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.
- J. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 1996 (Reapproved 2002).
- K. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- L. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than ten years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS**2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. Knauf Insulation;
 - 2. Johns Manville Corporation;
 - 3. Owens Corning Corp;
 - 4. CertainTeed Corporation;
 - 5. Substitutions: Not permitted.
- B. Insulation: ASTM C 553; flexible, noncombustible blanket.
 - 1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C 518.
 - 2. Maximum Service Temperature: 450 degrees F.
 - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E 96/E 96M.
 - 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Outdoor Vapor Barrier Mastic:
- F. Tie Wire: Annealed steel, 16 gage.

2.03 GLASS FIBER, RIGID

- A. Manufacturer:
 - 1. Knauf Insulation;
 - 2. Johns Manville Corporation;
 - 3. Owens Corning Corp;
 - 5. Substitutions: Not permitted.
- B. Insulation: ASTM C 612; rigid, noncombustible blanket.

1. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C 518.
 2. Maximum service temperature: 450 degrees F.
 3. Maximum Water Vapor Sorption: 5.0 percent.
 4. Maximum Density: 8.0 lb/cu ft.
- C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E 96/E 96M.
 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
 2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
1. Lagging Adhesive:
 - a. Compatible with insulation.
- B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.
- C. Aluminum Jacket: ASTM B 209 (ASTM B 209M).
1. Thickness: 0.016 inch sheet.
 2. Finish: Smooth.
 3. Joining: Longitudinal slip joints and 2 inch laps.
 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
 6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 1. Provide insulation with vapor barrier jackets.
 2. Finish with tape and vapor barrier jacket.
 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated ducts conveying air above ambient temperature:
 1. Provide with or without standard vapor barrier jacket.
 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- F. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 2. Secure insulation without vapor barrier with staples, tape, or wires.
 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- G. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
 2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
 3. Seal and smooth joints. Seal and coat transverse joints.
 4. Seal liner surface penetrations with adhesive.
 5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

- A. Combustion Air Duct:
1. Double Wall B-Vent
- B. Exhaust Ducts Within 10 ft of Exterior Openings:
1. Flexible Glass Fiber Duct Insulation: 1.5" inches thick.
 2. Rigid Glass Fiber Duct Insulation: 2" inches thick.
 3. Flexible Glass Fiber Duct Liner Insulation: 1.5" inches thick.
 4. Rigid Glass Fiber Duct Liner Insulation: 2 inches thick.
- C.. Outside Air Intake Ducts:
1. Rigid metal duct with 2" flexible glass fiber duct insulation.
- D. Ventilation Equipment Casings:
1. Minimum 2" Thick rigid foam casing insulation.
- E. Supply Ducts:
1. Flexible Glass Fiber Duct Insulation: 1.5" inches thick.
 2. Rigid Glass Fiber Duct Insulation: 2" inches thick.
 3. Flexible Glass Fiber Duct Liner Insulation: 1.5" inches thick.
 4. Rigid Glass Fiber Duct Liner Insulation: 2 inches thick.
- F. Supply ducts After Terminal Boxes:
1. Flexible Glass Fiber Duct Insulation: 1.5" inches thick.
 2. Rigid Glass Fiber Duct Insulation: 2" inches thick.
 3. Flexible Glass Fiber Duct Liner Insulation: 1.5" inches thick.
 4. Rigid Glass Fiber Duct Liner Insulation: 2" inches thick.
- M. Return and Relief Ducts in Mechanical Room:
1. Flexible Glass Fiber Duct Insulation: 2" inches thick.
 2. Rigid Glass Fiber Duct Insulation: 2" inches thick.
 3. Flexible Glass Fiber Duct Liner Insulation: 2" inches thick.
 4. Rigid Glass Fiber Duct Liner Insulation: 2" inches thick.

END OF SECTION

SECTION 230805 – PERFORMANCE TEST AND ADJUSTMENT OF HVAC SYSTEMS

PART 1 GENERAL

1.01 GENERAL PROVISIONS

- A. Provisions specified in Section 23 05 10, HVAC Basic Mechanical Requirements and Methods, apply to all work of Divisions 23.

1.02 SUMMARY

- A. This section covers the Contractor's responsibilities for deferred (Seasonal) Functional (Performance) Tests. The testing and adjustment will be performed after construction is completed and the building is fully occupied.
- B. Performance Testing and Adjustment of Mechanical Systems; Each subcontractor or installer responsible for the installation of a particular system or equipment item to be tested and adjusted is responsible for the commissioning activities relating to that system or equipment item.
- C. The entire mechanical systems shall be seasonal performance tested and adjusted including activities for the following specific items:
 - 1. HVAC Systems:
 - a. Air handlers
 - b. Fan & coil units
 - c. Fans

1.03 RELATED REQUIREMENTS

- A. Section 23 05 10 - Basic Mechanical Requirements and Methods.
- B. Section 23 05 93 - Testing, Adjusting, and Balancing (TAB).

1.04 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - 2007, HVAC & R Technical Requirements for the Commissioning Process

1.05 SUBMITTALS

- A. Submittal procedures:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Project Mechanical Engineer; in that case, submit to Project Mechanical Engineer first.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority for preparation of testing and adjustment summary to the Owner; submit in editable electronic format, Microsoft Word preferred.
 - 5. As soon as possible after submittals made to Project Mechanical Engineer are approved, submit copy of approved submittal to the Commissioning Authority.
 - a. Submit all system trend logs; Logs to indicate dates, times and ambient temperatures when the trends were made.
 - b. Summary report of all set points and adjustments made during performance testing and adjustment activities.
 - c. Prepare a bound manual of test results for each of the weather extremes and any recommendations of follow up testing to maintain maximum central plant performance.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 TAB COORDINATION

- A. TAB: Testing, adjusting, and balancing of HVAC.
- B. Coordinate with TAB schedule of completion and acceptance.
- C. Make final approved TAB report available to the Commissioning Authority.

3.02 EMS COORDINATION

- A. Coordinate with the completion of the EMS (BAS) Commissioning.
- B. Review the final commissioning reports for Prefunctional Checklist for the Controls (BAS) and the Calibration Procedures (sensors; actuators) to determine if the calibration is within the tolerance required for performance testing required by this section.
- C. Make final approved TAB report available to the Commissioning Authority.

3.03 PERFORMANCE TESTING AND TRENDING PROCEDURES

- A. Pre-functional Check lists and Functional Tests for the control system, air handler unit and other mechanical system components shall be completed and submitted to the Commissioning Authority. Check lists shall be signed and dated, certifying that all system programming is completed as required to accomplish the requirements of the Contract Documents and the detailed Sequences of Operation documentation submittal.
- B. Do not start trending and testing until all controlled components have themselves been successfully commissioned in accordance with the Contract Documents.
- C. Before starting the testing and trending phase, monitor all set points for the mechanical systems that will be performance tested and trended. Make set point adjustment based on fully occupied building spaces.
 - 1. Set point changing features and functions.
 - 2. Sensor calibrations.
 - 3. Confirm that features that are included but not specified to be setup are actually installed.
- D. During the trend logging on the following using the control system, for minimum period of 5 days including one weekend, if the control points are monitored by the EMS control system:
 - 1. Demand limiting, including over-ride of limiting.
 - 2. Sequential staging ON of equipment; optionally demonstrate manually.
 - 3. Optimum start-stop functions.
- E. During Performance Testing and trending phase, use only skilled technicians, who are familiar with the systems to be tested.

3.04 MECHANICAL SYSTEM PERFORMANCE TESTING AND TRENDING

- A. Scope:
 - 1. To verify that the HVAC and other mechanical systems are functioning as designed, meeting all of the conditions and set points while controls are set in automatic mode.
 - 2. Testing to verify that the system is meeting all of the design conditions during peak demand and minimum demand.
- B. Methods:
 - 1. Utilize the existing Carrier Comfort Works (CCW) to the extent to provide an operational trends log for the testing and verification. Before the trend logging is started, the accuracy of all sensors including flow meters that would be needed in

- the operational testing shall be completed. If these devices need calibration and or replacement, MECHANICAL Scientific System will perform this task.
2. Performance Testing to be performed under summer (August or September) conditions. Summer testing to be performed when the daily average high temperature is estimated to be 95 degrees or greater.
 3. Additional output programming will be necessary by Carrier to include coordinating all data for trend logging. Coordinated with DCA's Scientific System for trend reporting.
 4. Testing shall be for a continuous period of a minimum of 5 days including Saturday and Sunday. During the test period, all air handlers and fan and coil unit shall be included in the test. The trend logs shall show operating conditions of all systems for the same period. Outside air conditions (dry bulb, wet bulb and relative humidity) shall be trended for the period.
 5. Trend report each of HVAC and other mechanical systems to include the following:
 - a. Air Handlers: Mixed air (EAT); cold deck temperature (LAT); CFM (duct transverse velocity readings x duct area); sensible heat (btuh -tons) (Calculated); space temperature and humidity.
 - b. Fan and Coil Units: Mixed air (EAT); cold deck temperature (LAT); CFM (duct transverse velocity readings x duct area); sensible heat (btuh -tons) (Calculated); space temperature.
 6. Air Handler and Fan and Coil Trends: The trend logs shall include the calculated cooling load being supplied against the capacities listed on the Equipment Schedule. The calculated cooling load shall be within 10 percent of the capacity listed on the Equipment Schedule. If the capacity is outside of 10 percent, then the test period will increase to continuous 5 days or until the capacity is within the 10 percent. After the third extension is completed and the 10 percent of capacity is not attained, the test shall be stopped. Analyze how to enable and maintain the heat balance within 10 percent. Submit analysis to Project Mechanical Engineer to determine what further action is to be taken.

3.05 HVAC SYSTEM ADJUSTMENT

- A. Scope:
 1. Adjust the Air Handler fan's variable frequency drives (VFD) to accomplish the least cooling air flow to maintain building spaces at the required space temperature. Reducing the air flow will accomplish the least fan energy.
- B. Methods:
 1. Reduce the supply and return air fan speed to the point that the building space temperature set point cannot be maintained. The fan speed to be controlled from input signals to the VFD on the supply and return fans from the EMS. Trend log space temperatures along with relative humidity for all the zones on the Air Handler where the fan speed is being adjusted. The period of the trending shall be continuous for a minimum of 5 days including Saturday and Sunday. Throughout the trending period, room temperature variation shall be within 2 degrees of the set point and the relative humidity shall not exceed 55 percent.
 2. At the conclusion of the adjustment, measure the air flow (CFM) for each zone via a transverse duct measurement. Record the final CFM and submit to the Commissioning Authority. Include in the final report the fan motor amperage before and after the final adjustment to the fan speed.

END OF SECTION

SECTION 230913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air supply system.
- B. Thermostats.
- C. Humidistats.
- D. Automatic dampers.
- E. Damper operators.

1.02 RELATED REQUIREMENTS

- E. Section 23 33 00 - Air Duct Accessories: Installation of automatic dampers.
- G. Section 26 27 26 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods for Testing Dampers for Rating; Air Movement and Control Association International, Inc.; 2007.
- B. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; National Electrical Manufacturers Association; 2008.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
- D. Manufacturer's Instructions: Provide for all manufactured components.
- E. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
- F. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
- G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed at the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section documented experience approved by manufacturer.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Substantial Completion.

1.08 MAINTENANCE SERVICE

- A. Provide service and maintenance of control system for one year from Date of Substantial Completion.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. United Technologies system.
- B. Substitutions: Not permitted.

2.02 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.03 AIR SUPPLY**2.04 DAMPERS**

- A. Performance: Test in accordance with AMCA 500-D.
- B. Frames: Extruded aluminum, welded or riveted with corner reinforcement, minimum.
- C. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum, attached to minimum 1/2 inch shafts with set screws.
- D. Jamb Seals: Spring stainless steel.
- E. Linkage Bearings: Oil impregnated sintered bronze.
- F. Leakage: Less than one percent based on approach velocity of 2000 ft/min and 4 inches wg.
- G. Temperature Limits: -40 to 200 degrees F.

2.05 DAMPER OPERATORS

- A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
 - 1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
 - 2. Provide one operator for maximum 20 sq ft damper section.
- B. Electric Operators:
 - 1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.
 - 2. Product: Belimo
 - a. Substitutions: Not permitted.
- C. Inlet Vane Operators:
 - 1. High pressure with pilot positioners and sufficient force to move vanes when fan is started with vanes in closed position. Return vane operator to closed position on fan shutdown.

2.07 HUMIDISTATS

- A. Room Humidistats:
 - 1. Wall mounted, proportioning type.
 - 2. Throttling range: Adjustable 2 percent relative humidity.
 - 3. Operating range: 30 to 80 percent.
 - 4. Maximum temperature: 110 degrees F.
 - 5. Cover: Set point indication.

- 6. Product: Vaisala
 - a. Substitutions: Not permitted.
- B. Limit Duct Humidistat:
 - 1. Insertion, two position type.
 - 2. Throttling range: Adjustable 2 percent relative humidity.
 - 3. Operating range: 20 to 80 percent.
 - 4. Maximum temperature: 150 degrees F.
 - 5. Product: Vaisala
 - a. Substitutions: Not permitted.

2.08 INPUT/OUTPUT SENSORS

- A. Temperature Sensors:
 - 1. Resistance temperature detectors with resistance tolerance of plus or minus 0.1 percent at 70 degrees F, interchangeability less than plus or minus 0.2 percent, time constant of 13 seconds maximum for fluids and 200 seconds maximum for air.
 - 2. Measuring current maximum 5 mA with maximum self-heat of 0.031 degrees F/mW in fluids and 0.014 degrees F/mW in air.
 - 3. Provide 3 lead wires and shield for input bridge circuit.
 - 4. Use insertion elements in ducts not affected by temperature stratification or smaller than one square meter. Use averaging elements where larger or prone to stratification sensor length 8 feet or 16 feet as required.
 - 5. Insertion elements for liquids shall be with brass socket with minimum insertion length of 2-1/2 inches.
 - 6. Room sensors: Locking cover.
 - 7. Product: United technologies
 - a. Substitutions: Not permitted.
- B. Humidity Sensors:
 - 1. Elements: Accurate within 5 percent full range with linear output.
 - 2. Room Sensors: With locking cover matching pneumatic thermostats used, span of 10 to 60 percent relative humidity.
 - 3. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 - 100 percent relative humidity.
 - 4. Product: United Teconologies
 - a. Substitutions: Not permitted.
- C. Static Pressure Sensors:
 - 1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
 - 2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
 - 3. Accuracy: One percent of full scale with repeatability 0.3 percent.
 - 4. Output: 0 - 5 vdc with power at 12 to 28 vdc.
 - 5. Product: United Teconologies
- D. Carbon Monoxide Detectors:
 - 1. Single or multichannel dual level detectors, using solid state sensors with three year minimum life. Sensor replacement shall take maximum 15 minutes. Suitable over temperature range of 23 to 130 degrees F.
 - 2. Provide individual indicators and contractors for each level, initially calibrated for 50 ppm and 100 ppm.
 - 3. Maximum response time to 100 ppm CO calibration gas: Two minutes.

2.09 THERMOSTATS

- A. Electric Room Thermostats:
 - 1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
 - 2. Service: cooling only.
 - 3. Covers: Locking with set point adjustment, with thermometer.

- 4. Product: Carrier
- B. Line Voltage Thermostats:
 - 1. Integral manual On/Off/Auto selector switch, single or two pole as required.
 - 2. Dead band: Maximum 2 degrees F.
 - 3. Cover: Locking with set point adjustment, with thermometer.
 - 4. Rating: Motor load.
 - 5. Product: Honeywell
 - a. Substitutions: Not permitted.
- C. Room Thermostat Accessories:
 - 1. Thermostat Covers: Brushed aluminum.
 - 2. Insulating Bases: For thermostats located on exterior walls.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.
- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation of components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches and humidistats. Refer to Section 26 27 26.
- C. Provide guards on thermostats in public areas and where indicated.
- F. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors. Provide separate minimum outside air damper section adjacent to return air dampers with separate damper motor.
- G. Provide isolation (two position) dampers of parallel blade construction.
- H. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.
- I. Provide conduit and electrical wiring in accordance with Section 26 27 17. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

SECTION 232113 - HVAC PIPING**PART 1 GENERAL****1.01 GENERAL PROVISIONS**

- A. Provisions specified in Section 23 05 10, HVAC Basic Mechanical Requirements and Methods, apply to all work of Division 23.

1.02 SECTION INCLUDES

- A. This Section prescribes basic materials and execution methods to be utilized for work of all Sections of Division 23.
- B. Products in Part 2.00 of this Section list generic names followed by specific requirements. References to generic names in other Sections of Division 23 shall be construed to mean the products specified in this Section.
- C. Complete piping system for:
 - 6. Refrigerant piping .

PART 2 PRODUCTS**2.07 REFRIGERANT PIPING:**

- A. Type "K" hard copper with soldered fittings and silver soldered joints.

2.08 CONDENSATE DRAIN (PRIMARY AND SECONDARY)

- A. Type "L" hard copper with DWV copper fittings and soldered joints.
- B. Throttling valves: Globe valves.

2.10 PIPE HANGERS AND SUPPORTS

- A. General: Hangers and maximum hanger spacing shall conform to the following:
 - 1. Maximum Spacing Between hangers:

Pipe Size	Rod Size	Cast Iron Pipe	All Other Horizontal	Metal Pipes Vertical	PVC/CPVC Horizontal
3/4	3/8	-	6 ft.	10 ft.	3. ft.
1	3/8	-	6 ft.	10 ft.	3. ft.
1-1/4	3/8	-	6 ft.	One Story	4. ft.
1-1/2	3/8	-	6 ft.	One Story	4. ft.
2	3/8	5 ft.	10 ft.	One Story	4. ft.

- B. Beam attachments: painted finish; B-Line Figure B3050, or Owner-approved equivalent by Secure Strut & Hanger Co., Tolco or Unistrut.
- C. Clevis hangers:
 - 1. Standard hanger for steel pipe: Painted finish B-Line Figure, or Owner-approved equivalent by Secure Strut & Hanger Co., Tolco or Unistrut.
 - 2. For copper pipe: Electro-galvanized plastic coated; B-Line Figure B3100C, or Owner-approved equivalent by Secure Strut & Hanger Co., Tolco or Unistrut.
 - 3. AWWA type for iron pipe; painted finish; B-Line Figure B3102, or Owner-approved equivalent by Secure Strut & Hanger Co., Tolco or Unistrut.
- D. Protection Shields:
 - 1. Insulated pipe: Thermal hanger shield: 360 degree insert of calcium silicate totally encased in sheet metal shield; pipe shields Model A2000 (chilled water) or A3000 (other lines), or equivalent by Uni-Grip, or Insul-shield.

2. Bare pipe: Felt isolator; B-Line figure B3195, or approved equivalent by Secure Strut & Hanger Co. or Unistrut.
- E. Sleeves and flashings:
 1. Exterior wall: Wade 3600 or Owner-approved equivalent by Link Seal.
 2. Interior wall: Pipe shields Model WFB-CS, or Owner-approved equivalent by Pipe Shields Inc.
 3. Waterproofed floor: Wade W-3600.
 4. Floors: Pipe shields Model DFB-CS or QDFB-CS.
 5. Furnish materials and coordinate installation for flashing and counter flashing roof penetrations for vents, pipe, drains, and ducts.
 6. Materials:
 - a. Sheet metal : 24 gauge minimum ASTM 525, Class G90.
 - b. Sheet lead: 4 pounds per square foot.
 - c. Stainless steel: Minimum 24 gauge.
 - d. Sheet copper: 16 oz. per square foot.
 - e. Vent stack fitting: Josam 1830 or Jay R. Smith 1750.

2.11 MATERIALS - GENERAL

- A. All materials shall be new and the best of their respective kinds.
- B. Exposed finish trim, fittings, and pipe in finished rooms or spaces shall be chromium plated brass or be covered with chromium plated brass sleeves. Inside of cabinets exposed to view when doors are open shall be construed to be finished space.
- C. Provide valves with trim as recommended by manufacturer for service on which installed.
- D. Provide same type materials by one manufacturer throughout project.
- E. Standard lists of materials herein may include products not required for this project.

2.12 PIPE AND TUBE

- A. Steel pipe:
 1. ASTM A53 Grade B, schedule 40, seamless or electric resistance weld; ASTM A106 Grade B; or ASTM A120.
 2. Black or galvanized as specified.
 3. Beveled ends (B.E.), grooved (G.), or threaded and coupled (T&C), as specified in the applicable Division 23 Sections.
- B. Cast iron soil pipe: In accord with current issue of standards of the Cast Iron Soil Pipe Institute. Bitumastic-coated.
 1. Hub and spigot or No-Hub.
 2. Service weight.
- C. Polypropylene pipe: Flame-retardant polypropylene with thermal fusion system for joints; GSR FUSEAL or equivalent by Spirolite.
- D. Copper tube: ASTM B88, 20-ft. straight lengths, except provide soft temper in 60-ft. coils for underground work.
 1. Type "K" except where Type "L" is specified.
 2. Hard temper except where soft temper is specified.
- G. PVC pipe: Sch 40 and Sch 80 Type I, 160 psi at 73 deg. F, ASTM 1785 with solvent cement fittings. Solvent cement and purple cleaner shall be supplied by same manufacturer.
- H. CPVC pipe: Sch. 40 and Sch. 80, 230 psi at 73 deg. F, ASTM F441, with solvent cement fittings. Solvent cement and purple cleaner shall be supplied by same manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPING

- A. Refer to Section 23 05 10.
- B. It is intended that workmanship be the best standard practice of each trade.
- C. Run piping parallel to building construction. Do not run piping above electrical equipment.
- D. Unless detailed otherwise or specifically approved in writing by Owner, conceal all piping in walls, partitions, ceilings or furred spaces.
- E. Properly support all equipment and piping from main structural members. Provide secondary structural framing as required. Do not hang equipment or piping directly from slabs or decks.
- F. Properly pitch all piping for proper drainage.
- G. Isolate all piping from building structure.
- H. Where exterior watering piping is required, pipe shall be insulated and have metal insulation jacket.
- I. Properly wrap all copper and steel pipe and fittings below grade.
- J. Make up connections between piping of dissimilar metals with approved dielectric couplings.
- K. Do not permanently close-up, furr-in, or cover-over completed piping runs until they have been inspected and approved.
- L. Install exposed polished or enamel trim connections at fixtures with special care free from tool marks and exposed threads at fittings.
- M. Use reducing/increasing fittings where a change in pipe size occurs in a run.
- N. Bushings of any type are not permitted, except for insertion of the thermometers or gauges.
- O. Unless specifically specified or detailed otherwise, only cast iron soil pipe will be permitted be run beneath floor slabs on grade.
- P. Clean inside of pipe before installing it. Keep installed piping clean, and protect ends from foreign matter by capping or plugging them.
- Q. Install pipe so that it does not interfere with the opening of doors or apparatus, access to equipment, or to electrical equipment.
- R. Do not install pipes in such a way that they will appear torque to pumps. After pumps have been installed, and pumps have been operated, recheck and realign pumps if necessary.
- S. Do not install water pipes through electrical rooms, power electronic rooms, electrical equipment rooms, tele/data rooms, , or audio/visual rooms.
- T. Do not install piping above electrical equipment, such as starters, variable frequency drives, motor control centers, or disconnects.
- U. Provide flanges and unions throughout the pipe systems at all equipment. Make provisions for servicing and removal of equipment without dismantling piping.
- V. Piping passing through or under grade beams or through foundation walls, if approved by the project structural engineer, shall be provided with a schedule 40 steel pipe sleeve two sizes greater than the pipes passing through the sleeves.
- Z. Plastic pipe:

1. All plastic pipe shall be joined with proper fittings. Solvent or fusion weld to pipe in accord with manufacturer's recommendations.

AA. Copper Tube:

1. Make all connections and changes of direction with factory fittings, except that tubing may be bent to a radius not less than three times the pipe diameter provided that bends are made using proper bending tools and no appreciable flattening or distortion of tube results.
2. Cut tube with a tubing cutter. Ream and clean ends to a bright finish. Clean inside of fitting sockets to a bright finish.
3. Make-up solder joints with appropriate paste flux and solder with 95/5 solder, unless specified otherwise.
4. Make-up silver solder (brazed) joints with appropriate flux and silver solder with silver brazing alloy.

AF. Drain Pans: Provide 16 gauge galvanized sheet metal drain pans below pipes conducting liquids of any kind as indicated on drawings.

1. Pane shall be 2 1/2 in. deep and reinforced with angle iron frame. Support and brace pans as required.
2. Run 3/4 in. copper drain to waste receptor.

AG. Underground pipe system coating:

1. Protect all underground copper and steel piping as follows, unless specified otherwise:
 - a. Surface preparation: remove oil, grease, rust, scale, moisture, metal burrs, weld slag, and other foreign materials. All sharp points shall be removed.
 - 1) Use Hexane, Toluol, Toluene, Xylol. Do not use oil-based solvents for cleaning.
 - b. Priming: Use JM No. 22 primer to obtain the maximum coating bond to pipe and also to act as a filter for flawed coating surfaces.

AH. Sleeves and escutcheons:.

1. Sleeves:
 - a. Provide sleeves for all pipes passing through floors, walls and ceilings. Extend sleeves 2 in. above floors. Make sleeves flush with walls and ceilings.
 - b. At concrete construction, set sleeves, or Owner-approved equivalent, for penetration of underground walls.
 - c. Provide Link Seal wall sleeves, or Owner-approved equivalent, for penetration of underground walls.
 - 1) Escutcheons: Provide chrome-plated hinged escutcheon with set screws at each exposed pipe passing through a wall, floor, or ceiling in finished portions of the building.
 - 2) Escutcheons Shall be Beacon or equal No. 13 for pipe sizes through 6in. and Beacon or equal No. 3 for pipe sizes larger than 6 in. Where piping insulated, escutcheons shall fit around outside of insulation.

AI. Openings:

1. Except where specifically indicated on Drawings, openings for piping for equipment will not be allowed in any structural members without written consent of Owner. For openings through concrete construction, install sleeves in forms before concrete is placed.
2. In the event additional openings are required through structural members, or notching, boring or cutting of the structure is necessary, perform the work as directed in writing by Owner.
3. Include all costs for cutting of holes required for installation of work.

- AJ. Waterproofing: Make absolutely watertight all openings through waterproofed construction caused by the penetration of mechanical work.
- AK. Thrust blocks: Provide thrust blocks at vertical and horizontal underground pipe locations, such as branch tees, directional changes, and where required to prevent the separation of mechanical type pipe joints in accord with recommendations of AWWA and DIPRA (Ductile Iron Pipe Research Association).
- AL. Pipe detection tracing:
 - 1. Provide wire tracing for all underground non-metallic piping systems.
 - 2. Copper tracer wire shall be #14 AWG solid, single conductor, insulated copper wire. Place in pipe trench above the pipe at maximum depth of 3ft. Do not secure to the pipe.
 - 3. Terminate at each building near pipe entrance. Rise through conduit to weatherproof junction box mounted on building wall. Label box "Tracer Wire" with name of service.
- AN. Below ground piping installation: In accord with manufacturer's recommendations
- AO. All branch take-offs shall be from the top of water main run.
- P. All air handling condensate drain piping shall be 3/4 in minimum size and shall have a union installed within 2 ft. of outlet and drain pan.

3.02 PREINSULATED CONDUIT INSTALLATION

- A. Install in accord with manufacturer's instructions and under direct supervision of manufacturer's field installation specialist employed by manufacturer and have at least 5 yr. of field piping installation experience. Credentials shall be submitted to Owner for approval.

3.03 SEISMIC BRACING AND ANCHORAGE

- A. Seismic bracing and anchorage of piping shall be done in accord with "Guidelines for Seismic Restraining of Mechanical Systems," latest edition, published by SMACNA, and in compliance with local codes.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Backdraft dampers.
- B. Duct access doors.
- C. Duct test holes.
- D. Flexible duct connections.
- E. Volume control dampers.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.
- B. NFPA 92A - Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences; 2009.
- C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc.; Current Edition, Including
- F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
- D. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.05 PROJECT RECORD DOCUMENTS

- A. Record actual locations of access doors and test holes.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

1.08 EXTRA MATERIALS

- A. See Section 01 60 00 - Product Requirements, for additional provisions.
- B. Provide two of each size and type of fusible link.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

- A. Manufacturers:

1. Krueger;
2. Ruskin Company;
3. Titus;
4. Substitutions: Not permitted.

2.02 BACKDRAFT DAMPERS

- A. Manufacturers:
 1. Louvers & Dampers, Inc; www.louvers-dampers.com.
 2. Nailor Industries Inc; www.nailor.com.
 3. Ruskin Company; www.ruskin.com.
 4. Substitutions: Not permitted.
- B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.04 DUCT ACCESS DOORS

- A. Manufacturers:
 1. Nailor Industries Inc; www.nailor.com.
 2. Ruskin Company; www.ruskin.com.
 3. SEMCO Incorporated; www.semcoinc.com.
 4. Substitutions: Not permitted.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
 1. Less Than 12 inches Square: Secure with sash locks.
 2. Up to 18 inches Square: Provide two hinges and two sash locks.
 3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
 4. Larger Sizes: Provide an additional hinge.
- D. Access doors with sheet metal screw fasteners are not acceptable.

2.05 DUCT TEST HOLES

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

2.07 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
 - a. Net Fabric Width: Approximately 2 inches wide.
 2. Metal: 3 inches wide, 24 gage thick galvanized steel.
- C. Lead Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

2.09 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 1. Louvers & Dampers, Inc; www.louvers-dampers.com.
 2. Nailor Industries Inc; www.nailor.com.
 3. Ruskin Company; www.ruskin.com.

4. Substitutions: Not permitted.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- C. Splitter Dampers:
 1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
- D. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
- E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame
- F. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- G. Quadrants:
 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment; see Section 22 05 48.
- J. For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.
- K. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- L. Use splitter dampers only where indicated.

- M. Provide balancing dampers on high velocity systems where indicated. Refer to Section 23 36 00 - Air Terminal Units.
- N. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 234000 - HVAC AIR CLEANING DEVICES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Disposable panel filters.
- B. Filter frames.
- C. Filter gages.

1.02 RELATED REQUIREMENTS

- A. Not Applicable.

1.03 REFERENCE STANDARDS

- A. AHRI 850 - Performance Rating of Commercial and Industrial Air Filter Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2004.
- B. UL 900 - Standard for Air Filter Units; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 PERFORMANCE REQUIREMENTS

- A. Conform to AHRI 850 Section 7.4.
 - 1. Dust Spot Efficiency: Plus or minus 5 percent.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.
- D. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.
- E. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.

1.06 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS**2.01 FILTER MANUFACTURERS**

- A. Farr:
- B. AAF International/American Air Filter: www.aafintl.com.
- C. Airguard:
- D. Substitutions: Not permitted.

2.02 DISPOSABLE PANEL FILTERS

- A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
- B. Performance Rating:
 - 1. Face Velocity: 500 FPM.
- C. Holding Frames: 20 gage minimum galvanized steel frame with expanded metal grid on outlet side and steel rod grid on inlet side, hinged with pull and retaining handles.

2.03 FILTER FRAMES AND HOUSINGS

- A. General: Fabricate filter frames and supporting structures of 16 gage galvanized steel or extruded aluminum T-section construction with necessary gasketing between frames and walls.
- B. Standard Sizes: Provide for interchangeability of filter media of other manufacturers; for panel filters, size for 24 x 24 inches filter media, minimum 2 inches thick; for extended surface and high efficiency particulate air filters, provide for upstream mounting of panel filters.
- C. Side Servicing Housings: Flanged for insertion into ductwork, of reinforced 16 gage galvanized steel; access doors with continuous gasketing and positive locking devices on both sides; extruded aluminum tracks or channels for primary secondary filters with positive sealing gaskets.

2.04 FILTER GAGES

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. H.O. Trerice Co: www.trerice.com.
 - 3. Weiss Instruments: www.weissinstruments.com.
 - 4. Substitutions: Not permitted.
- B. Direct Reading Dial: 3-1/2 inch diameter diaphragm actuated dial in metal case, vent valves, black figures on white background, front recalibration adjustment, range 0-2.0 inch WG, 2 percent of full scale accuracy.
- C. Inclined Manometer: One piece molded plastic with epoxy coated aluminum scale, inclined-vertical indicating tube and built-in spirit level, range 0-3 inch WG, 3 percent of full scale accuracy.
- D. Accessories: Static pressure tips with integral compression fittings, 1/4 inch aluminum tubing, 2-way or 3-way vent valves.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Install filter gage static pressure tips upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum, in accessible position. Adjust and level.
- D. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.
- E. Provide filter gages on filter banks, installed with separate static pressure tips upstream and downstream of filters.

END OF SECTION

SECTION 260510 – ELECTRICAL BASIC REQUIREMENTS AND METHODS**PART 1 – GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work in this section.
- B. Refer to Division 16, Electrical, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding electrical work.

2.01 BIDDING REQUIREMENTS AND RESPONSIBILITIES

- A. Prime bidder is responsible for all work, of all trades and sub-contractors bidding this project. It is the prime bidder's responsibility, prior to submitting a bid to ensure that sub-contractors coordinate all aspects of the work between trades, sub-contractors, etc. to the fullest extent possible.
- B. Prime bidder shall ensure that all sub-contractors, suppliers, equipment vendors, etc., obtain all necessary and pertinent contract document information pertaining to their work prior to the submission of a bid. Contractor shall realize that different sub-contractors may furnish equipment, accessories, devices, etc. necessary for a complete and working installation that require provision of services by another sub-contractor or trade.
- C. Bidders of all or any portions of this section or division are required to review all contract documents including but not limited to Architectural drawings, Structural drawings, Mechanical drawings, Plumbing drawings, Electrical drawings, etc. to coordinate requirements and responsibilities with and through prime bidder.
- D. Bidders of all or any portions of this section or division, by furnishing a bid on a portion of the prime contract are indicating that they have received all contract documents and coordinated services provided under their portion of the work with the prime bidder; they are indicating that they have expressed any pertinent questions (which would result from a detailed, thorough review of the entire set of contract documents) to the prime bidder in accordance with Division 1 requirements, prior to bidding.
- E. All timely, pertinent, questions provided in writing prior to bids, in accordance with Division 1 requirements, will be clarified, defined, or otherwise explained in a written addendum and/or addendums prior to bids, in accordance in Division 1 requirements.
- F. It is not the intention of these contract documents to leave any issue relating to coordination between trades or sub-contractors vaguely defined. The intention is to define all issues, coordination matters, equipment requirements, sizes, routing, etc. to the satisfaction of the prime bidder, prior to receipt of bids.
- G. Bidders of all or any portions of this section or division, by virtue of the submission of a bid to the prime bidder, are indicating that they have reviewed the entire set of contract documents with due diligence and regard for the Owner's desire for a comprehensive and complete bid proposal; that they have expressed all concerns or questions requiring clarification on matters of coordination between trades and/or sub-contractors; that they have expressed any such concerns or questions in writing in accordance with Division 1 requirements.

- H. Prime bidders, by submission of a comprehensive bid on the project are indicating that the subcontractors selected in their bid have complied with all Division 1 requirements, that they have indicated in writing, prior to bidding, all questions or concerns requiring clarification and/or explanation and have documented any and all specific exclusions involving work that would generally be considered to be work of their trade. The prime bidder shall coordinate all work so that anything excluded by the bidder of all or any portions of this section or division, have been addressed prior to bids in one of the following manners:
1. The work has been confirmed, by the prime bidder, to be work of another trade or subcontractor (whose proposal is also being accepted).
 2. Clarification of the matter has been made through the prime design professional via written addendum and is clearly and mutually understood by the prime bidder and the party raising the issue/question, or seeking clarification.
 3. The work has been accepted as the responsibility of the prime contractor directly.

3.01 **WORK INCLUDED**

- A. Provide all labor, materials, equipment, fees, licenses, and services to complete and coordinate all electrical work with Architect, suppliers, subcontractors, inspectors, and utility authorities, as indicated on the drawings, as specified herein or both except as for items specifically indicated as "NIC ITEMS".

4.01 **MATERIAL AND EQUIPMENT**

- A. The term "provide" when used in the Contract Documents includes all items necessary for the proper execution and completion of the Work.
- B. Specific reference in the Specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Architect expressed in writing is equal to that specified.
- C. Coordinate and properly relate all Work of this Division to building structure and work of all other trades.
- D. Visit premises and become thoroughly familiar with existing conditions; verify all dimensions in field. Advise Architect of any discrepancies prior to Bid Date in accordance with Division 0.
- E. Do not rough-in for any item or equipment furnished by others or noted "Not in Contract" (NIC), without first receiving rough-in information or determining rough-in requirements from other trades and/or Architect.
- F. Provide storage and protection for all equipment and materials in accordance with requirements of Division 0 and Division 1. Replace any equipment and materials damaged by improper handling, storage, or protection, at no additional cost to Owner.
- G. Keep premises clean in accordance with requirements of Division 0 and Division 1.

5.01 **DEFINITIONS**

- A. Provide: Furnish, install and connect complete.

- B. The Drawings shall not be construed as shop drawings. In the event of a possible interference with piping or equipment of another trade, items requiring set grade and elevations shall have precedence over other items. Should any major interference develop, immediately notify the Architect.
- C. Review of shop drawings: A service by the Engineer to reduce the possibility of materials being ordered which do not comply with Contract Documents. The Engineer's review shall not relieve the Contractor of responsibility for dimensions or compliance with the contract documents. When an error is not detected, this does not grant the Contractor permission to proceed in error.
- D. Wiring: Wire and cable, installed in raceway with boxes, fittings, connectors and supports.
- E. Work: Materials completely installed.

6.01 **REFERENCES**

- A. Refer to Division 1 for temporary electrical service and temporary construction lighting.

7.01 **DRAWINGS AND SPECIFICATIONS**

- A. The Electrical Drawings are schematic in nature and are not intended to show the exact location of conduit, outlets, etc.
- B. The Drawings and Specifications shall both be considered as part of the Contract. Any work or material shown in one and omitted in the other, or which may fairly be implied by both or either, shall be provided in order to give a complete job.
- C. Should conflicts exist between the Drawings and Specifications, the Contractor shall ask for clarification prior to doing and conflicting work.
- D. Refer to the architectural, structural, plumbing, sprinkler and HVAC plans and details for dimensions, and fit the work to conform to the details of building construction. The right is reserved to shift any switch, receptacle, ceiling outlet or any special outlet a maximum of 10'-0" from its location as shown before it is permanently installed, without incurring additions to the contract.

8.01 **CODES AND REGULATIONS**

- A. Comply with the following codes, regulations, and laws:
 - 1. National Electric Code with local attachment (year adopted by the local authority)
 - 2. National Fire Protection Code (years and chapters as adopted by the state and local codes).
 - 3. American National Standards Institute
 - 4. Americans with Disabilities Act of 1990
 - 5. Florida Building Code
 - 6. All other applicable codes and standards including the requirements of local utilities companies.
- B. Equipment shall conform to requirements and recommendations of the National Bureau of Fire Underwriters and National Fire Protection Association (NFPA).

- C. Items provided under this Division shall comply with the American National Standards Institute (ANSI) "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People," ANSI A 117.1, and the Americans with Disabilities Act (A.D.A.).
- D. Work called for in these Plans and Specifications shall be executed by competent workmen.
- E. In the possible event of conflict between codes or regulations and Contract Documents, notify the Architect/Engineer immediately.
- F. The drawings show approximate locations only of feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Architect reserves the right to make reasonable changes in locations indicated, before roughing-in, without additional cost to the Owner.

9.01 **FEES, PERMITS, AND TAXES**

- A. Obtain and pay for permits required for the Work of this Division. Pay fees in connection therewith, including necessary inspection fees.
- B. Pay any and all taxes levied for Work of this Division, including municipal and/or state sales tax where applicable.

10.01 **MANUFACTURER'S DIRECTIONS**

- A. Install and operate equipment and material in strict accord with manufacturer's installation and operating instructions. The manufacturer's instructions shall become part of the Contract Documents and shall supplement Drawings and Specifications.

11.01 **PROJECT COORDINATION**

- A. Refer to applicable Division 26 Sections for products work of this Division.
- B. Refer to Division 23 for related products affecting work of this section.
- C. Coordinate handling of all products, materials, etc., through general contractor. Coordinate space, access, clearances, etc., through general contractor prior to preparation of shop drawing submittal.

12.01 **PROJECT RECORD DOCUMENTS**

- A. During construction period, keep accurate records of installations made under this Division, paying particular attention to major interior and exterior underground and concealed piping, ductwork, etc.

PART 2 - PRODUCTS

1.01 **STANDARDS**

- A. All material shall be new and shall conform to the applicable standard or standards where such have been established for the particular material in question.

- B. Material of the same type shall be the product of one manufacturer.
- C. U.L. listed material shall bear U.L. Label.

2.01 **CONCRETE**

- A. Provide 3000 psi concrete for all Division 16 applications including transformer and switchboard housekeeping pads.

3.01 **PLYWOOD**

- A. Interior Applications:
 - 1. Fire-retardant-treated plywood with a flame spread of 25 or less identified as "Interior Type A".
- B. Exterior Applications:
 - 1. Fire-retardant-treated plywood with a flame spread of 25 or less identified as "Exterior".

4.01 **EQUIPMENT LABELS**

- A. Panelboards, safety switches, equipment cabinets, motor starters and other equipment shown on the drawings and furnished and/or installed under this section of the Specifications shall be labeled with laminated plastic nameplates inscribed to identify equipment with description shown on the drawings for panels, the name of the equipment controlled for motor starters or the system or function involved for other equipment. Nameplates shall be white with black etched letters. Provide typewritten panelboard directories indicating the equipment served, final approved room numbers, etc., as shown on the Plans or as directed by the Architect.

PART 3 - EXECUTION

1.01 **VISIT TO SITE**

- A. Prior to submitting proposal, visit the site and become familiar with the conditions relating to Division 16000 work.
- B. No allowances will be made for lack of knowledge of existing conditions.

2.01 **TRENCHING AND BACKFILLING**

- A. All trenching, backfilling and compaction requirements shall be in accordance with other sections of these specifications.
- B. Provide excavating and backfilling necessary for Work of this Division. Comply with provisions of Division 2, Site Work, if applicable.
- C. Trenches shall be inspected by Code Authorities and/or Owner's Representative before and after piping is laid. Give Owner's Representative 24-hour notice for each inspection. If any trenches are filled without Owner's Representative inspection and as subsequently found to be deficient, the trenches shall be uncovered, inspected, and then refilled, if requested by Owner's Representative.

- D. Provide minimum 24 inches of cover to finish grades or paving at raceways.
- E. Protect and maintain trenches in dry condition until piping has been inspected and approved. Immediately after approval, backfill trenches in tamped layers. Repeat backfill and tamping 6 months after initial coverage has been accomplished to avoid swale development from sinking soils.
- F. Compact fill to satisfaction of Architect and/or Owner's Representative.
- G. Trench excavation in excess of 5 feet deep shall comply with OSHA Standard 29 C.F.R.s. 1926.650 Subpart P.

3.01 **CUTTING AND PATCHING**

- A. Comply with requirements of Division 0 and Division 1 regarding cutting and patching. Locate and timely install sleeves as required to minimize cutting and patching.
- B. Cutting, fitting, repairing, patching, and finishing of Work shall be done by craftsmen skilled in their respective trades. Where cutting is required, cut in such a manner as not to weaken structure, partitions, or floors. Holes required to be cut must be cut or drilled without breaking out around the holes. Where patching is necessary in finished areas of the building, the Architect will determine the extent of such patching and refinishing.
- C. Repairing Roadways and Walks: Where this contractor cuts or breaks roadways or walks to lay the piping, he shall repair or replace these sections to match existing, unless specifically identified as the responsibility of others.

4.01 **PAINTING**

- A. Painting shall be provided under Division 9, unless specified otherwise. Leave exposed piping, materials, and equipment clean and free of rust, grease, dirt, etc. before and after painting.
- B. Factory finished equipment, fixtures, and materials which are marred, chipped, scratched, or otherwise unacceptable shall be repaired or replaced under this Division to Architect satisfaction, at no additional cost to Owner.
- C. Coordinate all painting requirements with prime bidder prior to bids. **All** exposed conduit, materials, hangers, anchors, etc., are to be primed and painted. Color shall be to match adjacent surfaces where not specifically designated otherwise. All galvanized materials shall be suitably treated prior to painting to ensure adhesion.

5.01 **EXISTING CONDITIONS**

- A. The Electrical Contractor shall visit the building site to determine existing conditions and will be held responsible for allowing for these conditions in his bid.
- B. Note that this area of work will have storm drainage, mechanical and electrical utilities located underground and within and under the buildings. It is part of this work for the Electrical Contractor to determine the scope and location of all utilities to be installed with this project and arrange his work around others. There will be no extra consideration for work discovered as being hidden after the bid, and no change orders for extra cost that may be caused by unknown after bid conditions. The drawings show approximate locations only of feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Architect reserves

the right to make reasonable changes in locations indicated, before roughing-in, without additional cost to the Owner.

6.01 **PROTECTION OF APPARATUS**

- A. The Electrical Contractor shall take precautions necessary at all times to properly protect his apparatus from damage. Failure on the part of the Contractor to comply with the above to the Architect's satisfaction shall be sufficient cause for the rejection of the particular piece of apparatus in question.

7.01 **DELIVERY, HANDLING, PROTECTION OF MATERIALS AND STORAGE**

- A. Ship, deliver and store products in the manufacturer's protective packing to prevent damaging.
- B. Handle equipment carefully to prevent damage to components, breakage and denting or scoring of surfaces and finishes.
- C. Store all equipment and products in clean, dry spaces. Protect all equipment from dirt, fumes, water, chemicals, construction debris and physical damage. Any equipment exposed directly to moisture will not be acceptable and shall be replaced.
- D. Replace damaged products and equipment. Repair and repaint marred and damaged finishes to original factory finish as directed by manufacturer and as herein specified.
- E. Keep all conduit and other openings protected against entry of foreign matter.

8.01 **COORDINATION**

- A. Prior to rough-in of any materials, coordinate with other subcontractors the physical clearances for the sequencing of Division 16000 work as it interfaces with and relates to Civil, Architectural, Structural, Plumbing, Sprinkler and HVAC systems.
- B. Coordinate and verify power company service requirements prior to bid. Bid to include all work required.
- C. Piping, ductwork, conduit and equipment installed at variance with the above requirements shall be relocated and/or revised at the expense of the Contractor and without incurring additions to the Contract.

9.01 **CODES AND REGULATIONS**

- A. In the event of a conflict between codes, the more restrictive code shall apply.
- B. Other codes and regulations as referenced herein after in this specification are applicable to this Section.

10.01 **PERMITS AND INSPECTIONS**

- A. Secure and pay for all division 16000 permits, fees, licenses and inspections.

11.01 **STANDARDS FOR MATERIALS AND WORKMANSHIP**

- A. Use materials that are new and, where U.L. has established standards, U.L. listed and labeled.

- B. Organize and execute work so that finished appearance is neat; plumb when vertical and level when horizontal.

12.01 **COORDINATION OF TRADES**

- A. Where work is in close proximity to the work of other contractors, the Electrical Contractor shall review plans of other contractors and coordinate his work with theirs. The Electrical Contractor shall verify the location of lighting fixtures, beams, structural members, conduit, ductwork, pipes or other obstructions before beginning his work in the area. Notify the Architect where proper clearances do not occur or where the work of others would interfere with the safe and/or proper operation of this work.

13.01 **PRODUCT SUBSTITUTIONS**

- A. The Contract for construction shall be based upon products and standards established in the Contract Documents without consideration of proposed substitutions.

14.01 **SUPPORTS AND FOUNDATIONS**

- A. Support all items covered by this Specification directly from building structural members independent of any ceilings or any other installed item. Panelboards and switches may be attached to suitably reinforced walls. Ground or slab mounted equipment to be mounted on a separate four inch high concrete slab.
- B. Do not attach items of this Specification to HVAC ductwork, ceiling grids and ceiling support members, piping or other equipment unless specifically shown otherwise. Where applicable, all equipment including conduit is to be supported from overhead wall, floor or roof structures using galvanized channel or angle members for a rigid support. Position supports and equipment such that access through lay-in ceilings or panels is not impaired and all Code required clearances are maintained.
- C. Where applicable, under no circumstances is the Electrical Contractor to attach to or support from any bar joist bridging. Any supports to the bar joists or any structural systems are to be approved by the Architect. All supplemental angle or channel iron required to support equipment of this Specification is to be furnished by the Electrical Contractor.

15.01 **EQUIPMENT LAYOUT**

- A. The physical location and arrangements of electrical equipment is shown on the Plans and is to be used by the Electrical Contractor as a guideline in construction. It is the responsibility of the Electrical Contractor to review the Plans with the proposed equipment and equipment of other contractors that are affected, and to insure that all Code required clearances, wiring distances and maintenance accesses, including equipment heights, of all items are maintained. The contractor is to provide a 1/4 inch scaled drawing showing all equipment, including those of other contractors. Include shop drawing cut sheets and applicable information. Indicate on the drawing by dimension all required Code clearances, wiring distances and maintenance access requirements. Where equipment heights are required to be coordinated with architectural or other items, indicate revised heights. Alternate arrangements to accomplish the above due to field conditions or changes in physical size of the equipment proposed for the project are to be submitted to the Architect for review before any work is begun or equipment ordered.

16.01 **GUARANTEE**

- A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing of lamps. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.
- B. If the Contractor's office is in excess of a fifty (50) mile radius of the project, he shall appoint a local qualified contractor to perform any emergency repairs or adjustments required during the guarantee period. The name of the contractor appointed to provide emergency services shall be submitted to the Architect for his approval.

17.01 CLEANING

- A. Clean all light fixtures, lamps and lenses prior to final acceptance. Replace all inoperative lamps.

18.01 PROHIBITION OF ASBESTOS AND PCB

- A. The use of any process involving asbestos or PCB, and the installation of any product, insulation, compound or material containing or incorporating asbestos or PCB, is prohibited. The requirements of this specification for complete and operating electrical systems shall be met without the use of asbestos or PCB.

END OF SECTION

SECTION 260519 - LOW VOLTAGE POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wire and cable for 600 volts and less.
- B. Wiring connectors and connections.
- C. Multiconductor cables and terminations.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 53 - Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 WIRING REQUIREMENTS

- A. Concealed Dry Interior Locations: Use only building wire in raceway, building wire with Type THHN/THWN insulation in raceway, nonmetallic-sheathed cable, armored cable, or metal clad cable.
- B. Exposed Dry Interior Locations: Use only building wire in raceway, building wire with Type THHN/THWN insulation in raceway, nonmetallic-sheathed cable, armored cable, or metal clad cable.
- C. Above Accessible Ceilings: Use only building wire in raceway, building wire with Type THHN/THWN insulation in raceway, nonmetallic-sheathed cable, armored cable, or metal clad cable.
- D. Wet or Damp Interior Locations: Use only building wire with Type XHHW-2 insulation in raceway, direct burial cable, armored cable with jacket, or metal clad cable.
- E. Exterior Locations: Use only building wire with Type XHHW-2 insulation in raceway, direct burial cable, service-entrance cable, armored cable with jacket, or metal clad cable.
- F. Underground Installations: Use only building wire with Type XHHW-2 insulation in raceway, direct burial cable, service-entrance cable, armored cable, or metal clad cable.
- G. Use stranded conductors for feeders and branch circuits 10 AWG and smaller.
- H. Use stranded conductors for control circuits.
- I. Use conductor not smaller than 12 AWG for power and lighting circuits.
- J. Use conductor not smaller than 14 AWG for facility motor and lighting control circuits.
- K. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- L. Conductor sizes are based on copper unless indicated as aluminum or "AL".

2.02 WIRE AND CABLE MANUFACTURERS

- A. Cerro Wire Inc: www.cerrowire.com.
- B. Industrial Wire & Cable, Inc: www.iewc.com.
- C. Southwire Company: www.southwire.com.
- D. American Insulated Wire Corporation: www.aiwc.com.
- E. Houston Wire and Cable Company: www.houwire.com.
- F. Alcan Cable: www.cable.alcan.com.
- G. Substitutions: Not permitted.

2.03 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor:
 - 1. For Sizes Smaller Than 1/0 AWG: Copper.
 - 2. For Sizes 1/0 AWG and Larger: Copper or Aluminum as noted on drawings.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: NFPA 70, Type THHN/THWN or XHHW-2.

2.05 WIRING CONNECTORS**2.06 LOW VOLTAGE SPLICES (POWER CABLES)**

- A. Cold shrink splices meeting requirements of ANSI C119-1 for splices rated up to 1000 volts. Splice shall form a moisture tight seal and shall be located in semi-dry areas.
 - 1. Product: 3M 8420 series or QSLV series.

2.07 LOW VOLTAGE MULTICONDUCTOR CABLES

- A. Low Voltage Cable Manufacturers:
 - 1. Belden: www.belden.com.
 - 2. West Penn: www.westpenn-cdt.com.
 - 3. Alphawire: www.alphawire.com.
 - 4. TMB: www.tmb.com
 - 5. Gepco: www.gepco.com.
 - 6. Anixter: www.anixter.com.
 - 7. National Wire and Cable Co.: www.nationalwire.com.
 - 8. Okonite: www.okonite.com.
 - 9. Superior Essex: www.superioressex.com.
 - 10. Substitutions: not permitted.
- B. Multiconductor low voltage cables for systems as identified below. Designation noted in parenthesis used to identify cables on the drawings.
 - 7. Fire Alarm Cables:
 - a. Unshielded: Single twisted pair solid bare copper conductors No. 12 AWG with PVC 300V rated insulation in red PVC jacket, CSFM listed. Belden No. 9582 (.340" O.D.). NEC Class FPLR (2C#12 FPLR).
 - b. Unshielded: Single twisted pair solid bare copper conductors No. 14 AWG with PVC 300V rated insulation in red PVC jacket, CSFM listed. Belden No. 9580 (.303" O.D.). NEC Class FPLR (2C#14 FPLR).

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire and cable has been completed.
- C. Verify that raceway installation is complete and supported.
- D. Verify that field measurements are as indicated.

3.02 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.03 INSTALLATION

- A. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Route wire and cable as required to meet project conditions.
 - 1. Wire and cable routing indicated is approximate unless dimensioned.
 - 2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
 - 3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.
- C. Use wiring methods indicated. Combining building wiring branch circuits or feeders into common runs from the design intent shown on the drawings is not acceptable.
- D. Pull all conductors into raceway at same time.
- E. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- F. Protect exposed cable from damage.
- G. Support cables above accessible ceiling, using spring metal clips or metal or plastic cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- H. Use suitable cable fittings and connectors.
- I. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- J. Clean conductor surfaces before installing lugs and connectors.
- K. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise. Branch circuit conductor splicing is not allowed unless otherwise approved by Owner.
- L. Terminate aluminum conductors with lugs rated for both copper and aluminum conductors. Fill with anti-oxidant compound before installing conductor. Terminate conductors using torque wrench and tighten to connector manufacturer's published data.
- M. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- N. Use insulated mechanical connectors for copper conductor splices and taps, 6 AWG and larger.
- O. Use solderless pressure connectors with insulating covers for conductor splices and taps, 8 AWG and smaller.
- P. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- Q. Use silicon filled underground direct burial type safety connectors for copper conductor splices and taps at all outdoor, wet and direct burial locations.
- R. 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.

3.04 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA STD ATS, except Section 4.
- B. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

END OF SECTION

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding components.
- B. Provide all components necessary to complete the grounding system(s) consisting of:
 - 1. Metal underground water pipe.
 - 2. Metal frame of the building.
 - 3. Concrete-encased electrode.
 - 4. Rod electrodes.
 - 5. Ground Bus Assemblies.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low Voltage Power Conductors and Cables..

1.03 REFERENCE STANDARDS

- A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.
- B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.04 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: no greater than 5ohms.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- E. Products: Listed and classified by Underwriters Laboratories Inc. or approved nationally recognized testing laboratories (NRTL) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.03 CONNECTORS AND ACCESSORIES

- A. Mechanical Connectors: Bronze.
- B. Exothermic Connections:
 - 1. Product: Cadweld manufactured by Erico.
 - 2. Product: BurndyWeld manufactured by FCI Connect.
 - 3. Product: Furseweld manufactured by Thomas and Betts.
- C. Wire: Stranded copper.
- D. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

- J. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Parallel feeders shall be provided with a ground conductor in each distinct conduit. Terminate each end on suitable lug, bus, or bushing.
- K. Ground continuity shall be maintained throughout all electrical components.

3.03 FIELD QUALITY CONTROL

- A. Provide field inspection in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA STD ATS except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

END OF SECTION

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.02 RELATED SECTIONS

- A. Section 07 84 13 - Firestopping: Materials and methods for work to be performed by this installer.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- D. Products: Listed and classified by Underwriters Laboratories Inc. or approved nationally recognized testing laboratory (NRTL) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.02 MATERIALS

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit. Hot dip galvanized or cadmium plated. Stainless steel or reinforced fiberglass for wet or damp locations.
- B. Supports - General: Fabricated of structural steel or formed steel members; galvanized.
 - 1. Roof top conduit supports:
 - a. Closed cell medium density black polyethylene foam, UV resistant with integral steel support channel.
 - b. Absorbs vibration and shock.
 - c. Accommodates expansion and contraction of piping.
- C. Anchors and Fasteners:
 - 2. Concrete Structural Elements: Use precast inserts.
 - 3. Steel Structural Elements: Use beam clamps.
 - 4. Concrete Surfaces: Use self-drilling anchors.
 - 5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
 - 6. Solid Masonry Walls: Use preset inserts.
 - 7. Sheet Metal: Use sheet metal screws.
 - 8. Wood Elements: Use wood screws.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
 - 1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
 - 2. Do not drill or cut structural members.
- B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

- C. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
- E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- F. Use one or two hole straps for single conduit runs on walls or ceilings.
- G. For gangs of two or more conduits, use beam clamps attached to main steel structural support members to attach solid steel threaded rods for supporting formed steel channel trapezes. For single conduits, use hangers with solid steel threaded rods attached to main steel structural members using beam clamps.
- H. Do not penetrate with any fastenings more than 1-1/2 inches into reinforced concrete beams or more than 3/4 inch into reinforced concrete joists to prevent contact with reinforcing bars.
- J. Roof top conduit supports:
 - 1. Install supports to load rating in accord with manufacturer's instructions and at a maximum spacing of 8 feet.
 - 2. Field cutting of foam block is not acceptable.
 - 3. Channel strut shall be bonded to the foam block.
 - 4. Permanently and securely bond foam block to the roof with weather resistant adhesive or mastic that is compatible with the roofing material and has been approved by the roofing contractor.
 - 5. Wood blocks or members shall not be used to support any electrical conduits, boxes or other electrical items.

END OF SECTION

SECTION 260534 - CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduit, fittings and conduit bodies.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 13 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems.
- E. Section 26 05 37 - Boxes.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.
- D. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- E. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.
- G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association; 2005.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association; 2003.
- I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.
- J. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. or approved nationally recognized testing laboratory (NRTL) as suitable for purpose specified and shown.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept conduit on site. Inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit or PVC coated conduit from sunlight.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

- A. Conduit Size: Comply with NFPA 70.
 - 1. Minimum Size: 1/2 inch unless otherwise specified.
- B. Underground Installations:

1. More than 5 Feet from Foundation Wall: Use rigid steel conduit, intermediate metal conduit, plastic coated conduit, or schedule 40 PVC.
 2. Within 5 Feet from Foundation Wall: Use rigid steel conduit, intermediate metal conduit, plastic coated conduit, thickwall nonmetallic conduit, or schedule 40 PVC.
 3. In or Under Slab on Grade: Use galvanized rigid steel conduit or schedule 40 pvc.
 4. Minimum Size: 1/2 inch.
- C. Outdoor Locations Above Grade: Use galvanized rigid steel conduit.
- D. In Slab Above Grade:
1. Use galvanized rigid steel conduit or schedule 40 pvc.
 2. Maximum Size Conduit in Slab: 3/4 inch; ____ inch for conduits crossing each other.
- E. Wet and Damp Locations: Use galvanized rigid steel conduit or Schedule 80 PVC.
- F. Dry Locations:
1. Concealed: Use rigid steel conduit, rigid aluminum conduit, intermediate metal conduit, or electrical metallic tubing.
 2. Exposed: Use galvanized rigid steel conduit, rigid aluminum conduit, intermediate metal conduit, or electrical metallic tubing.

2.02 METAL CONDUIT

- A. Manufacturers:
1. Allied Tube & Conduit: www.alliedtube.com.
 2. Beck Manufacturing, Inc: www.beckmfg.com.
 3. Wheatland Tube Company: www.wheatland.com.
 4. Substitutions: Not permitted.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Rigid Aluminum Conduit: ANSI C80.5.
- D. Intermediate Metal Conduit (IMC): Rigid steel.
- E. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.03 PVC COATED METAL CONDUIT

- A. Manufacturers:
1. Allied Tube & Conduit: www.alliedtube.com.
 2. Thomas & Betts Corporation: www.tnb.com.
 3. Robroy Industries: www.robroy.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NEMA RN 1; rigid steel conduit with external PVC coating.
- C. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick with large radius elbows.
- D. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.04 FLEXIBLE METAL CONDUIT

1. AFC Cable Systems, Inc: www.afcweb.com.
 2. Electri-Flex Company: www.electriflex.com.
 3. International Metal Hose: www.metalhose.com.
 4. Allied Tube & Conduit (Eastern): www.alliedtube.com.
 5. Substitutions: Not permitted.
- B. Description: Interlocked steel construction.
- C. Fittings: NEMA FB 1.

2.05 LIQUIDTIGHT FLEXIBLE CONDUIT (METALLIC & NONMETALLIC)

- A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.
4. Allied Tube & Conduit (Eastern): www.alliedtube.com.
5. Lamson & Sessions (Carlon): www.carlon.com.
6. Substitutions: Not permitted.

B. Metallic Flexible Conduit:

1. Description: Interlocked steel construction with PVC jacket.
2. Fittings: NEMA FB 1.

C. Nonmetallic Flexible Conduit:

1. Description: Nonconductive and noncorrosive type LFNC-B.
2. Fittings: NEMA FB 1.

2.06 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedtube.com.
2. Beck Manufacturing, Inc: www.beckmfg.com.
3. Wheatland Tube Company: www.wheatland.com.
4. Substitutions: Not permitted.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.07 NONMETALLIC CONDUIT

A. Manufacturers:

1. Lamson & Sessions (Carlon): www.carlon.com.
2. Allied Tube & Conduit: www.alliedtube.com.
3. Cantex: www.cantexinc.com.
4. Queen City Plastics: www.queencityplastics.com.
5. Southern Pipe Inc.: www.southern-pipe.com.
6. Endot: www.endot.com.
7. Substitutions: Not permitted.

B. Description: NEMA TC 2; Schedule 40 PVC. Schedule 80 shall be UV rated.

C. Fittings and Conduit Bodies: NEMA TC 3.

D. Innerduct: PVC corrugated, corrosion resistant, crush resistant, highly flexible orange 1" duct with pull tape and duct plug.

1. Carlon DF4X1C-1000 duct and MAEPG2 blank plug or equivalent by Endot.

2.08 NONMETALLIC TUBING

A. Manufacturers:

1. Beck Manufacturing, Inc: www.beckmfg.com.
2. Cantex Inc: www.cantexinc.com.
3. Lamson & Sessions (Carlon): www.carlon.com.
4. Substitutions: Not permitted.

B. Description: NEMA TC 2.

C. Fittings and Conduit Bodies: NEMA TC 3.

2.09 CONDUIT BODIES, HUBS, FITTINGS, SEALS AND SEALING COMPOUNDS

A. Manufacturers:

1. O-Z Gedney: www.o-zgedney.com.
2. Hubbell-Killark: www.hubbell-killark.com.
3. Thomas & Betts: www.tnb.com.
4. Lamson & Sessions (Carlon): www.carlon.com.
5. Appleton: www.appletonelec.com.

6. Cooper Crouse Hinds: www.crouse-hinds.com.
 7. Pipeline Seal & Insulator Inc. (PSI): www.linkseal.com.
 8. PRC-Desoto International Inc. (Semco): www.ppg.com/prc-desoto/.
 9. Substitutions: Not permitted.
- B. Bodies and fittings of same material as conduit.
 - C. Compressible rubber modular sealing products (i.e. Link Seal®) for all core drilled conduit penetrations through concrete or masonry to provide a watertight seal.
 - D. Expandable polyurethane foam (Semco® PR-821 by PRC-DeSoto) with density of 7 - 8 pounds per cubic foot for sealing of conduits with or without cables entering manholes, pullboxes or electrical rooms to seal against intrusion of water or gases.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

- A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install steel conduit as specified in NECA 101.
- C. Install nonmetallic conduit in accordance with manufacturer's instructions.
- D. Arrange supports to prevent misalignment during wiring installation.
- E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- F. Group related conduits; support using conduit rack. Construct rack using steel channel ; provide space on each for 25 percent additional conduits.
- G. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
- H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- I. Do not attach conduit to ceiling support wires.
- J. Arrange conduit to maintain headroom and present neat appearance.
- K. Route exposed conduit parallel and perpendicular to walls.
- L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- M. Route conduit in and under slab from point-to-point.
- N. Maintain adequate clearance between conduit and piping, 6 inches minimum.
- O. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F and between any power system (nominally 110V or above) and low voltage system (nominally below 110V) conduits.
- P. Combining conduit runs or conduit homeruns for any systems from those shown on the drawings is not acceptable.
- Q. Maintain separation of EMS 300V rated cables and any power cables entering a motor controller (individually mounted or within an MCC). Do not combine cables within any wireway, box or conduit until cables have entered the controller. A transition junction box with terminal strips to convert between 300V cable and building wire is not acceptable.
- R. Cut conduit square using saw or pipecutter; de-burr cut ends.
- S. Bring conduit to shoulder of fittings; fasten securely.

- T. 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 20 minutes, minimum.
- U. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.
- V. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.
- X. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- Y. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control, and expansion joints.
- Z. Provide polypropylene or nylon pull line in each empty conduit except sleeves (maximum 10 feet in length) and nipples. Add tag at each end identifying opposite end location.
- AA. Use suitable caps to protect installed conduit against entrance of dirt and moisture. Install caps on ends of all stubbed out underground conduits.
- AB. Ground and bond conduit under provisions of Section 26 05 26.
- AC. Identify conduit under provisions of Section 26 05 53.
- AD. Conduits containing multiconductor cables that are terminated with connectors plugged on the exterior of equipment shall terminate with a bushing no further than 6 inches and no closer than 3 inches from the equipment. These locations are as indicated on reference interconnect diagrams.
- AE. Where conduits enter an enclosure, box, panel or cabinet or other fitting through a knockout, provide locknut and bushing on inside of enclosure.
- AF. Interior conduits exiting concrete slabs:
 - 1. Extend metal conduit minimum 36 inches prior to adapting to EMT.
 - 2. Extend PVC conduit minimum 12 inches prior to adapting to metal conduit.
 - 3. Conduit entering a junction box or enclosure within 60 inches of exiting a slab shall be of the same continuous material.
 - 4. A rigid coupling flush with concrete slab shall be used to adapt to metallic conduit.
- AG. Flexible conduits:
 - 1. Metal flexible conduit for connection to equipment subject to vibration and for connection to light fixtures above suspended ceilings, maximum 6 foot lengths.
 - 2. Liquidtight flexible conduit at all damp, wet and outdoor locations.
 - 3. Non metallic flexible conduit for connections into electronic equipment racks.
- AI. Underground conduits and conduits in concrete:
 - 1. 24 inch minimum cover for underground conduits outside of building foundations.
 - 2. Concrete encasement not required for conduits outside of building foundations containing branch circuits, dimmer circuits, audio, or control cables unless indicated otherwise on drawings.
 - 3. 12 inch minimum cover for conduits under building floor slabs or under other concrete structures. Stub up risers shall be perpendicular to the horizontal at the point of entry into the bottom of the slab or structure.
 - 4. Minimum 1 inch cover for conduits in concrete slabs, walls or roof.
 - 5. Bell end bushings for conduit entries into underground manholes and pullboxes, or along side the CUTB.

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation specified in Section 07 52 00 (07550).

END OF SECTION

SECTION 260537 - BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.
- C. In ground pullboxes and handholes.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 13 - Firestopping.
- B. Section 26 27 26 - Wiring Devices: Wall plates in finished areas.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.
- C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008.
- D. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 2008.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.
- G. ANSI/SCTE 77 - Specification for Underground Enclosure Integrity, American National Standards Institute and Society of Cable Telecommunications Engineers.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Provide products listed and classified by Underwriters Laboratories Inc., or approved nationally recognized testing laboratory (NRTL) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Appleton Electric: www.appletonelec.com.
- B. Thomas & Betts (Steel City and Red Dot): www.tnb.com.
- C. Hubbell (Raco and Bell): www.hubbell-raco.com.
- D. O-Z Gedney: www.o-zgedney.com.
- E. Cooper Crouse Hinds: www.crouse-hinds.com.
- F. Lamson & Sessions (Carlon): www.carlon.com.
- G. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
 - 3. Ceiling outlet boxes not less than 4 inch octagonal x 2 1/8 inch deep.

- 4. Communications outlet boxes not less than 4 11/16 inch square x 2 1/8 inch deep.
- B. Nonmetallic Outlet Boxes: NEMA OS 2.
- C. Cast Boxes: NEMA FB 1, Type FD, cast fer alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- D. Wall Plates for Finished Areas: As specified in Section 26 27 26.

2.03 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel not less than 4 inches square x 2 1/8 inch deep.
- B. Nonmetallic boxes: NEMA OS 2, PVC with hubs and gasketed covers.
 - 1. NEMA 6P with gasketed covers and stainless steel screws for outdoor direct burial locations.
 - 2. Raintight hubs on sides of outdoor above grade boxes, no top entry hubs.
 - 3. Use for underground branch circuits, lighting circuits or audio applications only.
- C. Hinged Enclosures: As specified in Section 26 27 16.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

3.02 INSTALLATION

- A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
- C. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
 - 1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
 - 2. Combining pull boxes or junction boxes from those shown on the drawings is not acceptable unless code restrictions apply due to actual field conditions.
- E. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- F. Maintain headroom and present neat mechanical appearance.
- G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- I. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- J. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- K. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- L. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- M. Use flush mounting outlet box in finished areas.
- N. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening. Use square cornered type boxes or boxes fitted with rings of sufficient depth so box is wholly contained within cavity of block and no mortar is required between masonry and box.
- O. Provide separate boxes for emergency power and normal power systems.

- P. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- Q. Locate outlet boxes so that wall plates do not span different building finishes.
- R. Locate outlet boxes so that wall plates do not cross masonry joints.
- S. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation.
 - 1. Provide minimum 24 inches separation in acoustic rated walls.
 - 2. Provide minimum 24 inches separation in fire rated walls.
- T. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- U. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- V. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- W. Use adjustable steel channel fasteners for hung ceiling outlet box.
- X. Do not fasten boxes to ceiling support wires.
- Y. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- Z. Use gang box where more than one device is mounted together. Do not use sectional box.
- AA. Use gang box with plaster ring for single device outlets.
- AB. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- AC. Close unused open knockouts in interior boxes with knockout seals. Close unused screw holes in exterior boxes with stainless steel screws, nuts or washers.
- AD. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted sheet metal boxes in other locations.
- AE. In ground precast boxes: Provide a 6 inch base of compacted gravel under box extending minimum 4 inches beyond all four sides of the box.

3.03 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install plaster rings in outlet boxes in areas where concrete will be exposed after construction is complete.
- C. Install knockout closures in unused box openings.

3.04 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.
- D. Field-painted identification of conduit and junction boxes.

1.02 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. or approved nationally recognized testing laboratory (NRTL) as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Seton Identification Products: www.seton.com/aec.
- C. Hellermann Tyton: www.hellermannityton.com.
- D. Panduit Corporation: www.panduit.com.
- E. Thomas & Betts: www.tnb.com.
- F. Ideal Industries Inc.: www.idealindustries.com.
- G. Electromark: www.electromark.com.
- H. Substitutions: Not permitted.

2.02 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, white letters on black background for equipment that is not powered by an emergency system and white letters on a red background for equipment that is powered by an emergency system and black letters on a yellow background for equipment that is optional standby. Outdoor nameplates shall be UV resistant.
- B. Locations:
 - 1. Each electrical distribution and control equipment enclosure.
 - 2. Contactor cabinets.
 - 3. Audio and Video Breakout Boxes.
- C. Letter Size:
 - 1. Use 1/4 inch letters for identifying individual equipment and loads.
 - 2. Use 3/8 inch letters for identifying grouped equipment and loads.
- D. Labels: Embossed adhesive tape, with 1/8 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations, and source circuit designation on front of wireways and pullboxes.
 - 1. Install arc flash warning labels on switchboards, distribution boards, branch circuit panelboards, control panels and motor control centers.

2. Install label on each switchboard, distribution board, branch circuit panelboard or motor control center identifying system voltage and conductor phase color coding within.
3. Install designation label for each relay or contactor within control or contactor cabinets.
4. Install caution label on control panels or branch circuit panelboards with integral control compartments. Label shall be red with white letters reading "Caution, external control voltage circuit within this panel".
5. Install "from and to" identifier label at each underground conduit's stubup location.
6. Install warning label on contactor cabinets reading "Warning, this cabinet energized from more than one source".

2.03 WIRE MARKERS

- A. Description: Vinyl cloth type self-adhesive wire markers.
- B. Description: tape or split sleeve type wire markers.
- C. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.
- D. Legend:
 1. Power and Lighting Circuits: Branch circuit (includes source panel and circuit number) or feeder identification indicated on drawings. Branch circuit wire markers identifying both source panel and circuit number are not required at locations where the conductor is within a panel or within an adjacent wireway connected directly to a panel through short nipple conduits (i.e. dimmer cabinets). At these locations a circuit number marker only is acceptable.
 2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.04 WIREWAY, JUNCTION BOX AND PULLBOX COVER CIRCUIT MARKERS

- A. Identify with corresponding circuit designation on outside of wireways, junction boxes and pullboxes. Labels shall be installed on side of box if box is located such that it is visible to guests. Otherwise, install labels on cover.
- B. For identification of wireways, junction boxes and pullboxes, use 1/4 in. height lettering, P-Touch type, laminated, self-sticking tape markers such as Brother PT-1200.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

- A. Install nameplates and labels parallel to equipment lines.
- B. Secure nameplates to indoor equipment front using rivets. Outdoor nameplates to be secured using approved adhesive.
- C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify conduit and junction boxes using field painting under provisions of Section 09 90 00.
 1. Paint colored band on each fire alarm system conduit longer than 6 feet.
 2. Paint bands 20 feet on center.
 3. Colors:
 - a. Fire Alarm System: Red.

END OF SECTION

SECTION 260919 - ENCLOSED CONTACTORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General purpose contactors.
- B. Lighting contactors.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- B. Section 26 05 53 - Identification for Electrical Systems: Engraved nameplates.
- C. Section 26 28 13 - Fuses.

1.03 REFERENCE STANDARDS

- A. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000 (R2005).
- B. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; National Electrical Manufacturers Association; 2000.
- C. NEMA ICS 6 - Industrial Control and Systems: Enclosures; National Electrical Manufacturers Association; 1993 (R2006).
- D. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide dimensions, size, voltage ratings and current ratings.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Maintenance Data: Include instructions for replacing and maintaining coil and contacts.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. or approved nationally recognized testing laboratory (NRTL) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- B. Eaton Corporation; Cutler-Hammer Products: www.eaton.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. GE Industrial: www.geindustrial.com.
- F. Siemens: www.siemens.com.
- G. Substitutions: Not permitted.

2.03 LIGHTING CONTACTORS

- A. Description: NEMA ICS 2, magnetic lighting contactor.
- B. Configuration: Mechanically held, 3 wire control or electrically held as noted on drawings.
- C. Coil operating voltage: 120 volts, 60 Hertz.

- D. Poles: As required to match circuit configuration and control function.
- E. Contact Rating: Match branch circuit overcurrent protection, considering derating for continuous loads.
- F. Enclosure: NEMA ICS 6, Type 1.
- G. Accessories:
 - 1. Selector Switch: ON/OFF/AUTOMATIC.
 - 2. Indicating Light: Transformer, LED, 6V, push to test type, color as indicated on drawings.
 - 3. Auxiliary Contacts: Two, normally open.

2.04 ACCESSORIES

- A. Auxiliary Contacts: NEMA ICS 2, 2 field convertible contacts in addition to seal-in contact.
- B. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty type.
- C. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
- D. Indicating Lights: Transformer, LED, 6V, push to test type, color as indicated on drawings.
- E. Selector Switches: Rotary type.
- F. Relays: NEMA ICS 2, see section 26 09 16 (13801), Electric Controls and Relays.
- G. Control Power Transformers: 120 volt secondary, 100 VA minimum, in each enclosed contactor. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.

2.05 DISCONNECTS

- A. Combination Contactors: Combine contactor with disconnect in common enclosure.
- B. Disconnects: Thermal magnetic circuit breaker with integral thermal and instantaneous magnetic trip in each pole; UL listed.
- C. Disconnects: Fusible switch assembly; NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install enclosed contactors where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed contactors plumb. Provide supports in accordance with Section 26 05 29.
- C. Height: 5 ft to operating handle.
- D. Provide fuses for fusible switches; refer to Section 26 28 13 for product requirements.
- E. Provide engraved plastic nameplates; refer to Section 26 05 53 for product requirements and location.

3.02 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Perform applicable inspections and tests listed in NETA STD ATS, Section 7.16.1.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems: Nameplates.
- E. Section 26 28 13 - Fuses: Fuses for fusible switches and spare fuse cabinets.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision D, 2006.
- B. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association; 2009.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- F. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).
- G. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2006.
- H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007.
- I. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.
- L. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.
- M. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- O. UL 67 - Panelboards; Current Edition, Including All Revisions.
- P. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- Q. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- R. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- S. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Owner of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of overcurrent protective device.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Panelboard Keys: Two of each different key.
 3. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- E. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- B. Products: Listed and classified by Underwriters Laboratories Inc. or approved nationally recognized testing laboratory (NRTL) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation; Cutler-Hammer Products: www.eaton.com.
- B. General Electric Company: www.geindustrial.com.
- C. Schneider Electric (Square D): www.squared.com.
- D. Siemens: www.sbt.com.
- E. Substitutions: Not Permitted.

2.02 ALL PANELBOARDS

- A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 - 3. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 4X, stainless steel.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 - c. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

- K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.
- L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
 - 1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
- M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- N. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- O. Load centers are not acceptable.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Aluminum.
 - 3. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
 - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 - 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 3. Provide clear plastic circuit directory holder mounted on inside of door.
- F. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard ; provide insulated ground bus where indicated on drawings.
- G. Minimum Integrated Short Circuit Rating: As indicated.
- H. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
 - 1. Type SWD for lighting circuits.
 - 2. Type HACR for air conditioning equipment circuits.
 - 3. Class A ground fault interrupter circuit breakers where scheduled.
 - 4. Do not use tandem circuit breakers.
- J. Enclosure: NEMA PB 1, Type 1.

2.05 OVERCURRENT PROTECTIVE DEVICES

- A. Fusible Switches:
 - 1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
 - 2. Fuse Clips: As required to accept indicated fuses.
 - a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
4. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- B. Molded Case Circuit Breakers:
 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - b. Provide interchangeable trip units where indicated.
 6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 7. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
 - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
 - e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
 10. Do not use tandem circuit breakers.
 11. Do not use handle ties in lieu of multi-pole circuit breakers.
 12. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

2.06 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

2.07 SURGE PROTECTIVE DEVICES

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26 05 29.
- E. Install panelboards plumb.
- F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Provide grounding and bonding in accordance with Section 26 05 26.
 - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
 - 2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
- J. Install all field-installed branch devices, components, and accessories.
- K. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.
- L. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- N. Set field-adjustable circuit breaker tripping function settings as directed.
- O. Set field-adjustable ground fault protection pickup and time delay settings as directed.
- P. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.
- Q. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- R. Provide concrete housekeeping pads for panel boards extending to the floor under the provisions of Section 03 30 00. Provide 3 1/2" thick concrete pad, extend at least 2" beyond all sides, front and back of the equipment except where equipment extends to walls.
- S. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- T. Provide filler plates to cover unused spaces in panelboards.
- U. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated.
- V. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.
- W. Provide identification nameplate for each power distribution panelboard branch device in accordance with Section 26 05 53, clearly and specifically indicating the loads served.
- X. Provide arc flash warning labels in accordance with NFPA 70.
- Y. Provide floor markings to clearly indicate required working clearances where required by the authority having jurisdiction.
- Z. Ground and bond panelboard enclosure according to Section 26 05 26.

3.03 FIELD QUALITY CONTROL

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.

- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Fusible Switches: Perform inspections and tests listed in NETA STD ATS, Section 7.5.1.1.
- E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- F. Test GFCI circuit breakers to verify proper operation.
- G. Test AFCI circuit breakers to verify proper operation.
- I. Correct deficiencies and replace damaged or defective panelboards or associated components.
- J. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers in power distribution panelboards.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.
- C. Set adjustable circuit breakers with trips as indicated.

END OF SECTION

SECTION 262717 - EQUIPMENT WIRING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 34 - Conduit.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).
- C. Section 26 05 37 - Boxes.
- D. Section 26 05 53 - Identification for Electrical Systems.
- E. Section 26 27 26 - Wiring Devices.
- F. Section 26 28 18 - Enclosed Switches.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).
- B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).
- C. ANSI/UL 418 - Standard for Safety of Cord Sets and Power Supply Cords..
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. or approved nationally recognized testing laboratory (NRTL) as suitable for the purpose specified and indicated.

1.05 COORDINATION

- A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Conform to NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 26 28 18.
- C. Wiring Devices: As specified in Section 26 27 26.
- D. Flexible Conduit: As specified in Section 26 05 34.
- E. Wire and Cable: As specified in Section 26 05 19.
- F. Boxes: As specified in Section 26 05 37.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Motion switching sensors.
- C. Wall dimmers.
- D. Receptacles.
- E. Wall plates.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 37 - Boxes.
- B. Section 26 05 53 - Identification for Electrical Systems: Labels for wiring devices.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
- C. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).
- E. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).
- F. ANSI/UL 498 - Standard for Attachment Plugs and Receptacles.
- G. W-C-596 - General Specification for Electrical Power Connectors, Federal Specification of the General Services Administration.
- J. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.
- K. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- L. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- M. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.02 ALL WIRING DEVICES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Finishes: **White, unless otherwise indicated.**

2.03 WALL SWITCHES

- A. All Wall Switches: AC only, quiet operating, general-use **rocker switches, unless otherwise indicated**, with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Wall Switches: AC only general-use **rocker switch**, complying with NEMA WD 6 and WD 1, side wired.
 - 1. Body and Handle: **White** plastic with **rocker** handle unless otherwise noted on drawings.
 - a. Colored device bodies are required in specific guest accessible areas as designated by owner. Coordinate color selection with owner prior to ordering devices.
 - 2. Ratings:
 - a. Voltage: 120 volts, AC.
 - b. Current: 15 amperes.
- C. Switch Types: Single pole, double pole, 3-way, 4-way, SPDT momentary contact, three position, and center off.

2.06 RECEPTACLES

- A. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.
- B. Receptacles: Federal specification duty, complying with NEMA WD 6 and WD 1, side wired. Straight blade receptacles shall comply with UL 498. General use straight blade receptacles as identified by UL 498 are not acceptable.
 - 1. Device Body: **White** plastic unless otherwise noted on drawings.
 - a. Colored device bodies are required in specific guest accessible areas as designated by owner. Coordinate color selection with owner prior to ordering devices.
 - 2. Configuration: NEMA WD 6, type as specified and indicated.
 - 3. Single Convenience Receptacles: Type as specified on drawings.
 - 4. Duplex Convenience Receptacles: Type 5-15R.
- C. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements. Faceless GFCI device with test / reset buttons at locations noted on drawings.
- F. Product: Single RJ11 flush mount type phone jack.

2.07 WALL PLATES

- A. All Wall Plates: Comply with UL 514D.
 - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 - 2. Screws: Metal with slotted heads finished to match wall plate finish.
- B. Decorative Cover Plates: **White**, smooth plastic unless noted otherwise on drawings.
- C. Exterior Weatherproof Covers:
 - 1. Die cast aluminum with hinged cover rated for respective type of use as follows:
 - a. Outlet box weatherproof hoods: NEMA 3R, gasketed, for unattended use with cover closed, padlockable latching cover to meet OSHA lockout/tagout requirements with large cord opening.
 - b. Low profile weatherproof covers: Gasketed, approved for use with cover open, self closing hinged cover (two independent lids for duplex receptacles which are horizontally mounted).
 - c. Communication outlet weatherproof hoods: NEMA 3R for unattended use with cover closed, two cord openings.

2. Safety receptacles in guest accessible areas with low profile weatherproof metal covers.
3. GFCI receptacles with weatherproof metal hoods.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130.
- B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of wiring devices provided under this section.
 1. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 4. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
- I. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

- K. Install wall switches with OFF position down.
- L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- M. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- Q. Install identification label for wall switches and wall dimmers in accordance with Section 26 05 26 indicating load served when controlling loads that are not visible from the control location or multiple wall switches or wall dimmers are installed at one location.
- R. Install identification label for all receptacles in accordance with Section 26 05 26 indicating serving branch circuit.
- S. Install poke-through closure plugs in all unused core holes to maintain fire rating of floor.
- T. Install receptacles with grounding pole on top.
- U. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- V. Install decorative colored cover plates on switch, receptacle, and blank outlets in finished areas.
- W. Connect wiring devices by wrapping conductor around screw terminal.
- X. Use jumbo size plates for outlets installed in masonry walls.
- Y. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- Z. Install receptacles with weatherproof covers in horizontal position.
- AA. Install receptacles for plug in type show lighting fixtures within 18" of fixture location.
- AB. Install labels identifying source panel and circuit number for all receptacles.

3.04 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 26 05 37 to obtain mounting heights specified.
- B. Install wall switch 48 inches above finished floor.
- C. Install convenience receptacle 18 inches above finished floor.
- D. Install convenience receptacle 6 inches above counter.
- E. Install dimmer 48 inches above finished floor.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Operate each wall switch with circuit energized and verify proper operation.
- E. Verify that each receptacle device is energized.
- F. Test each receptacle to verify operation and proper polarity.
- G. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- H. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.06 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 262813 - FUSES

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.

2.01 SUMMARY

- A. Section Includes:
 1. Cartridge fuses rated 600-V ac and less for use in control circuits and enclosed switches.
 2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches and fuseholders.
 3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
 4. Spare-fuse cabinets.

3.01 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 3. Current-limitation curves for fuses with current-limiting characteristics.
 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
 5. Coordination charts and tables and related data.
 6. Fuse sizes for elevator feeders and elevator disconnect switches.
- B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 1. Ambient temperature adjustment information.
 2. Current-limitation curves for fuses with current-limiting characteristics.
 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Coordination charts and tables and related data.

4.01 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

5.01 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

6.01 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

7.01 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

PART 2 - PRODUCTS**1.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussmann, Inc.
 - 2. Edison Fuse, Inc.
 - 3. Ferraz Shawmut, Inc.
 - 4. Littelfuse, Inc.

2.01 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

3.01 PLUG FUSES

- A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

4.01 PLUG-FUSE ADAPTERS

- A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

5.01 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 - 2. Finish: Gray, baked enamel.
 - 3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
 - 4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION**1.01 EXAMINATION**

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

2.01 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.
- C. Install spare-fuse cabinet(s).

3.01 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 262818 - ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fusible switches.
- B. Nonfusible switches.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Nameplates.
- D. Section 26 28 13 - Fuses.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2002 (R2007).
- C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).
- D. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
 - 2. Include wiring diagrams showing all factory and field connections.

- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- E. Project Record Documents: Record actual locations of enclosed switches.
- F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.
- D. Products: Listed and classified by Underwriters Laboratories Inc. or approved nationally recognized testing laboratory (NRTL) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation; Cutler-Hammer Products: www.eaton.com.
- B. General Electric Company: www.geindustrial.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Siemens: www.sbt.com.
- E. ESL Power Systems Inc. (800) 922-4188.
- H. Substitutions: Not permitted.

2.02 COMPONENTS

- A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
 - 1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
 - 2. Handle lockable in OFF position.
 - 3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.
- B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
 - 1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
 - 2. Handle lockable in OFF position..
- D. Enclosures: NEMA KS 1.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Nema 3R

3. General Kitchen Area: Recessed type enclosures.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install enclosed switches in accordance with manufacturer's instructions.
- B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26 05 29.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Provide identification nameplate for each enclosed switch in accordance with Section 26 05 53.
- K. Provide identification label on inside door of each fused switch indicating NEMA fuse class and size installed in accordance with Section 26 05 53.
- L. Provide arc flash warning labels in accordance with NFPA 70.
- M. Install fuses in fusible disconnect switches.
- O. Install warning label on front of enclosure per NEC 110.16 to warn qualified persons of potential electric arc flash hazards.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 264313 - TRANSIENT VOLTAGE SUPPRESSION

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.

2.01 SUMMARY

- A. Section includes field-mounted TVSS for low-voltage (120 to 600 V) power distribution and control equipment.
- B. Related Sections:
 - 1. Division 26 Section "Switchboards" for factory-installed TVSS.
 - 2. Division 26 Section "Panelboards" for factory-installed TVSS.
 - 3. Division 26 Section "Wiring Devices" for devices with integral TVSS.

3.01 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. SVR: Suppressed voltage rating.
- C. TVSS: Transient voltage surge suppressor(s), both singular and plural; also, transient voltage surge suppression.

4.01 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating weights, electrical characteristics, furnished specialties, and accessories.
- B. Qualification Data: For qualified testing agency.
- C. Product Certificates: For TVSS devices, from manufacturer.
- D. Field quality-control reports.
- E. Operation and Maintenance Data: For TVSS devices to include in emergency, operation, and maintenance manuals.
- F. Warranties: Sample of special warranties.

5.01 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member Company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.
- C. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.
- D. Comply with NEMA LS 1.
- E. Comply with UL 1283 and UL 1449.
- F. Comply with NFPA 70.

6.01 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 1. Notify Construction Manager no fewer than two days in advance of proposed electrical service interruptions.
 2. Do not proceed with interruption of electrical service without Construction Manager's written permission.
- B. Service Conditions: Rate TVSS devices for continuous operation under the following conditions unless otherwise indicated:
 1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
 2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
 3. Humidity: 0 to 85 percent, noncondensing.
 4. Altitude: Less than 20,000 feet (6090 m) above sea level.

7.01 COORDINATION

- A. Coordinate location of field-mounted TVSS devices to allow adequate clearances for maintenance.
- B. Coordinate TVSS devices with Division 26 Section "Electrical Power Monitoring and Control."

8.01 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.
- B. Special Warranty for Cord-Connected, Plug-in Surge Suppressors: Manufacturer's standard form in which manufacturer agrees to repair or replace electronic equipment connected to circuits protected by surge suppressors.

9.01 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Replaceable Protection Modules: One of each size and type installed.

PART 2 - PRODUCTS**1.01 SERVICE ENTRANCE SUPPRESSORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. ABB USA.
 - 2. AC Data Solutions.
 - 3. Advanced Protection Technologies Inc. (APT).
 - 4. Atlantic Scientific.
 - 5. Current Technology Inc.; Danaher Power Solutions.
 - 6. Danaher Power Solutions; United Power Products.
 - 7. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 8. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 9. Intermatic, Inc.
 - 10. LEA International.
 - 11. Leviton Mfg. Company Inc.
 - 12. Liebert Corporation; a division of Emerson Network Power.
 - 13. Northern Technologies, Inc.; a division of Emerson Network Power.
 - 14. Siemens Energy & Automation, Inc.
 - 15. Square D; a brand of Schneider Electric.
 - 16. Surge Suppression Incorporated.
- C. Surge Protection Devices:
 - 1. Non-modular.
 - 2. LED indicator lights for power and protection status.
 - 3. Audible alarm, with silencing switch, to indicate when protection has failed.
 - 4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
- D. Surge Protection Devices:
 - 1. Comply with UL 1449.
 - 2. Modular design (with field-replaceable modules).
 - 3. Fuses, rated at 200-kA interrupting capacity.
 - 4. Fabrication using bolted compression lugs for internal wiring.
 - 5. Integral disconnect switch.
 - 6. Redundant suppression circuits.
 - 7. Redundant replaceable modules.

8. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
 9. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 10. LED indicator lights for power and protection status.
 11. Audible alarm, with silencing switch, to indicate when protection has failed.
 12. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
 13. Four-digit transient-event counter set to totalize transient surges.
- E. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.
- F. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2
1. Line to Neutral: 70,000 A.
 2. Line to Ground: 70,000 A.
 3. Neutral to Ground: 50,000 A.
- G. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120 V, 3-phase, 4-wire circuits shall be as follows:
1. Line to Neutral: 400 V for 208Y/120 V.
 2. Line to Ground: 400 V for 208Y/120 V.
 3. Neutral to Ground: 400 V for 208Y/120 V.
- H. Protection modes and UL 1449 SVR for 240/120 V, single-phase, 3-wire circuits shall be as follows:
1. Line to Neutral: 400 V.
 2. Line to Ground: 400 V.
 3. Neutral to Ground: 400 V.
- I. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:
1. Line to Neutral: 400 V, 800 V from high leg.
 2. Line to Ground: 400 V.
 3. Neutral to Ground: 400 V.
- J. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:
1. Line to Line: 1000 V for 240 V.
 2. Line to Ground: 1000 V for 240 V.

2.01 PANELBOARD SUPPRESSORS

- 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:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. ABB USA.
2. AC Data Solutions.
3. Advanced Protection Technologies Inc. (APT).
4. Atlantic Scientific.
5. Current Technology Inc.; Danaher Power Solutions.
6. Danaher Power Solutions; United Power Products.
7. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
8. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
9. Intermatic, Inc.
10. LEA International.
11. Leviton Mfg. Company Inc.
12. Liebert Corporation; a division of Emerson Network Power.
13. Northern Technologies, Inc.; a division of Emerson Network Power.
14. Siemens Energy & Automation, Inc.
15. Square D; a brand of Schneider Electric.
16. Surge Suppression Incorporated.

C. Surge Protection Devices:

1. Non-modular.
2. LED indicator lights for power and protection status.
3. Audible alarm, with silencing switch, to indicate when protection has failed.
4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

D. Surge Protection Devices:

1. Comply with UL 1449.
2. Modular design (with field-replaceable modules).
3. Short-circuit current rating complying with UL 1449, and matching or exceeding the panelboard short-circuit rating and redundant suppression circuits; with individually fused metal-oxide varistors.
4. Fuses, rated at 200-kA interrupting capacity.
5. Fabrication using bolted compression lugs for internal wiring.
6. Integral disconnect switch.
7. Redundant suppression circuits.
8. Redundant replaceable modules.
9. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
10. LED indicator lights for power and protection status.
11. Audible alarm, with silencing switch, to indicate when protection has failed.
12. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
13. Four-digit transient-event counter set to totalize transient surges.

E. Peak Single-Impulse Surge Current Rating: 120 kA per mode/240 kA per phase.

F. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2:

1. Line to Neutral: 70,000 A.
2. Line to Ground: 70,000 A.
3. Neutral to Ground: 50,000 A.

- G. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120 V, 3-phase, 4-wire circuits shall be as follows:
 - 1. Line to Neutral: 400 V for 208Y/120 V.
 - 2. Line to Ground: 400 V for 208Y/120 V.
 - 3. Neutral to Ground: 400 V for 208Y/120 V.
- H. Protection modes and UL 1449 SVR for 240/120-V, single-phase, 3-wire circuits shall be as follows:
 - 1. Line to Neutral: 400 V.
 - 2. Line to Ground: 400 V.
 - 3. Neutral to Ground: 400 V.
- I. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:
 - 1. Line to Neutral: 400 V, 800 V from high leg.
 - 2. Line to Ground: 400 V.
 - 3. Neutral to Ground: 400 V.
- J. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:
 - 1. Line to Line: 1000 V for 240 V.
 - 2. Line to Ground: 800 V for 240 V.

3.01 ENCLOSURES

- A. Indoor Enclosures: NEMA 250 Type 1.
- B. Outdoor Enclosures: NEMA 250 Type 3R.

PART 3 - EXECUTION

1.01 INSTALLATION

- A. Install TVSS devices at service entrance on load side, with ground lead bonded to service entrance ground.
- B. Install TVSS devices for panelboards and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
 - 1. Provide multiple, 30-A circuit breaker as a dedicated disconnecting means for TVSS unless otherwise indicated.

2.01 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
 - 1. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
 - 2. After installing TVSS devices but before electrical circuitry has been energized, test for compliance with requirements.
 - 3. Complete startup checks according to manufacturer's written instructions.
- E. TVSS device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.01 STARTUP SERVICE

- A. Do not energize or connect service entrance equipment to their sources until TVSS devices are installed and connected.
- B. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

4.01 DEMONSTRATION

- A. Train Owner's maintenance personnel to maintain TVSS devices.

END OF SECTION

SECTION 265100 – INTERIOR AND EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Exit signs.
- C. Ballasts: fluorescent and HID.
- D. Lamps.
- E. Luminaire accessories.
- H. Exterior luminaires, poles and accessories.

1.02 RELATED REQUIREMENTS

- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 37 - Boxes
- F. Section 26 27 26 - Wiring Devices.

1.03 REFERENCE STANDARDS

- A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.
- B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.
- D. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002.
- E. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- F. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.
- G. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems; 2000.
- H. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.
- I. IESNA RP-8 - American National Standard Practice for Roadway Lighting; Illuminating Engineering Society of North America; 2000 (ANSI/IES RP8).
- J. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).
- K. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.
- N. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2009.
- O. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
- Q. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Shop Drawings:
 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Conform to requirements of NFPA 70 and NFPA 101.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 01 77 70 - Closeout Procedures, for additional warranty requirements.
- B. Products: Listed and classified by Underwriters Laboratories Inc. or equivalent nationally recognized testing laboratory (NRTL) as suitable for the purpose specified and indicated.

1.10 COORDINATION

- A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

1.11 EXTRA MATERIALS

- A. See Section 01 60 00 - Product Requirements, for additional provisions.
- B. Furnish two of each plastic lens type.
- C. Furnish one replacement lamp for each lamp type.
- D. Furnish two of each ballast type.
- E. Furnish four fluorescent luminaire disconnects.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fixture schedule lists one or more acceptable manufacturers for each fixture type.
- B. Provide all lighting fixtures of each type from the same manufacturer.
- C. Refer to fixture schedule for acceptable manufacturers.

2.02 LUMINAIRES

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

2.03 LUMINAIRES

- A. Furnish products as indicated in Schedule attached to this section.
- B. Fluorescent Luminaire Disconnect: Each tube type fluorescent fixture shall be provided with a luminaire disconnect rated minimum 3A. at 120V. Temperature rating of 105°C, suitable for #12 through #18 AWG connection with either 2 wire or 3 wire leads.
 - 1. Product - Thomas and Betts "Sta-Kon" or Ideal "PowerPlug".

2.04 BALLASTS

- A. All Ballasts:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.05 LAMPS

- A. Manufacturers:
 - 1. GE Lighting: www.gelighting.com.
 - 2. Philips Lighting Co of NA: www.lighting.philips.com.
 - 3. Osram/Sylvania: www.sylvania.com
- B. All Lamps:
 - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
 - 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
 - 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
 - 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.
- C. Lamp Types: As specified for each luminaire. Fixture and lamp schedule at the end of this section shall be enforced in case of conflict with any specific lamp data noted below.
- D. Incandescent Lamps: Standard life, 130V.
- E. Fluorescent Lamps:
 - 1. Super T8 (1" diameter) energy saving straight tube lamps. Electronic or magnetic ballast and lamp combinations to be matched for starting method.

- a. Four foot lamp with rated life of 30,000 hours, minimum initial lumen output of 3150, minimum CRI of 85, and color temperature of 3000K.
 - b. Shatterproof tubes shall be provided for fluorescent lamps in all open style fluorescent fixtures such as strip lights or industrial reflector type fixtures (lamps not behind a protective barrier). Fixtures with wire guards shall also be provided with shatterproof tubes.
- 2. U-Bent super T8 type 32 watt fluorescent lamps shall have 6 inch leg spacing, minimum 20,000 hours rated life, minimum initial lumen output of 2850, minimum CRI of 82, and color temperature of 3000 K.
- 3. Compact fluorescent type T4 with single, double, triple or quad tubes with 4 pin bases. Lamps shall have minimum 10,000 hours rated life, CRI of 82 and a color temperature of 3000 K. Where noted, compact fluorescent lamps for use on dimming and electronic ballasts shall have minimum 12,000 hours rated life, CRI of 82 and a color temperature of 3000 K.
- 4. Compact fluorescent type T5 high lumen output lamps shall have minimum 20,000 hours rated life (18 watt, 1250 lumen or 40 watt, 3150 lumen), CRI of 82 and a color temperature of 3000 K.
- F. High Intensity Discharge (HID) Lamps:
 - 1. Metal halide lamps shall be coated ceramic type, universal operating position, type E17, PAR, or BT as noted for each individual fixture, encapsulated type for either open or closed bottom type fixtures, minimum CRI of 85 and a color temperature of 3000 K.
- G. Reflector Lamps: Beam patterns in accordance with ANSI C78.379. All line voltage halogen PAR lamps and low voltage reflector lamps shall have infrared conserving technology for maximum efficacy. Low voltage lamps shall have hard coated dichroic reflector and 4000 hours rated life. Line voltage halogen lamps shall be rated 130V.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) NECA 500 and 502.
- F. Provide a lighting fixture for each lighting outlet indicated.

- H. Support luminaires independent of ceiling framing. EMT conduit shall not be used to support suspended fixtures of any type. Suspension shall be by means of standard hangers, where available and applicable, by rigid threaded conduit and fittings, or by rods.
- I. Recessed luminaires:
 - 1. Provide recessed and semi recessed fixtures with plaster frames compatible with ceiling and wall systems employed and secure fixtures mechanically to frame.
 - 2. Install recessed luminaires to permit removal from below. Factory paint all trims for recessed ceiling fixtures in guest areas to match Owner provided custom color chip.
 - 3. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
 - 4. Locate recessed ceiling luminaires as indicated on reflected ceiling plan. Fixtures shall fit snugly against ceiling to prevent light leakage.
- J. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other at uniform elevations. Secure luminaires to prevent movement as follows:
 - 1. Fixtures not over 12 inches wide and not over 50 inches long: Minimum 2 fastenings.
 - 2. Fixtures not over 12 inches wide and over 50 inches long: Minimum 3 fastenings.
 - 3. Fixtures over 12 inches wide and not over 50 inches long: Minimum 4 fastenings.
 - 4. Fixtures over 12 inches wide and over 50 inches long: Minimum 6 fastenings.
- K. Where fixtures are to be mounted on, or suspended from, concrete ceilings, provide cast in place inserts.
- L. Fixtures shall not be supported by outlet box cover screws alone. Provide a fixture stud or "hickey" for fixtures weighing greater than 25 lbs. for added support.
- M. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Drawings.
- N. Install accessories furnished with each luminaire.
- O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture.
- P. Connect luminaires and exit signs to branch circuit outlets provided under Section 26 05 37 as indicated.
- Q. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- R. Bond poles and metal accessories to branch circuit equipment grounding conductor.
- S. Install specified lamps in each emergency lighting unit, exit sign, and luminaire. Install each lighting fixture with lamps indicated on lamp schedule.
- T. Replace any excessively noisy ballasts.
- U. Provide concrete bases for lighting poles or bollard type fixtures at locations indicated.
- V. Owner furnished fixtures:
 - 1. Install a designated fixture at each outlet indicated.
 - 2. Provide and install lamps for each fixture as noted in the show lighting lamp schedule.
 - 3. Provide necessary supports and hangers.
- W. Provide necessary hardware and connectors to make specified track lighting a complete operational system. System components shall be fabricated by the same manufacturer (i.e. fixtures, track, connectors, hanging hardware, etc.) to ensure compatibility.
- Y. Install lamps in each luminaire.
- Z. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

- B. Inspect each product for damage and defects.
- C. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00.
- D. Operate each luminaire after installation and connection to verify proper operation.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.
- F. Test each support for fixtures with a weight of not less than 50 lbs. or three times the weight of installed fixture, whichever is greater.
- G. Measure illumination levels to verify conformance with performance requirements. Take exterior lighting measurements during night sky, without moon or with overcast clouds effectively obscuring the moon.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.
- C. Aim and adjust fixtures as directed.
- E. Egress lighting shall have an adjustment period occurring after installation and verification of said equipment to achieve the average required emergency lighting level of 1 fc along the egress pathway. Provide appropriate personnel (electricians, carpenters, laborers, etc.) as necessary to support this adjustment period. Adjustment is defined as orientation or aiming of adjustable fixtures or clearing of light pathway from fixture location to the egress pathway.

3.06 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.
- F. Clean and relamp existing fixtures to be reused.

3.07 CLOSEOUT ACTIVITIES

- A. See Section 01 77 70 - Closeout Procedures, for closeout submittals.
- B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- C. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

3.09 PROTECTION

- A. Relamp burned out luminaires at Substantial Completion with new lamps of same type, manufacturer and wattage. This fixture relamping effort shall include reorientation of any fixture or fixture accessory that has been moved from its aim or focus and repairing or replacing any fixture accessory that has been damaged, removed, or misaligned as a result of fixture relamping.

END OF SECTION

SECTION 283100 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Maintenance of fire alarm system under contract for specified warranty period.
- C. Fire alarm system control panel.
- D. Analog smoke and heat sensors.
- E. Fire alarm notification appliances.
- F. Addressable circuit interface modules.
- G. Peripheral fire alarm equipment.
- H. Accessory relays to interface with ride systems, show control systems, audio control circuits, exit sign, egress lighting, HVAC, and smoke management systems.
- I. Programming modifications to the existing networked fire alarm reporting system.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low Voltage Electric Power Conductors and Cables.
- D. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- F. Section 23 33 00 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.
- G. Section 26 05 53 - Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits; 2002 (R2008).
- B. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage Power Circuits; 1991 (R1995).
- C. NFPA 70 - National Electrical Code; 2008.
- D. U.L. 268 - Smoke Detectors for Fire Protective Signalling Systems.
- E. U.L. 864 - Standard for Control Units and Accessories for Fire Alarm Systems.
- F. U.L. 1480 - Standard for Speakers for Fire Protective Signalling Systems.
- G. U.L. 1971 - Standard for Safety Signalling Devices for the Hearing Impaired.
- H. NFPA 72 - National Fire Alarm Code and Signaling Code ; 2010.
- I. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; 2009.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
 - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 2. Manufacturer's detailed data sheets for each control unit, initiating devices, and notification appliances including the following:
 - a. Control Panel.

- b. Analog addressable multi-criteria smoke and heat sensors.
 - c. Smoke and heat sensor bases.
 - d. Stand by emergency/secondary power supply.
 - e. Signalling appliances (horns, speakers, strobes, bells).
 - f. Manual alarm stations.
 - g. Manual alarm station breakglass safety covers.
 - h. Surge suppressors for power supply, initiating, signal line and notification circuits.
 - i. Addressable loop network cable and DC power cable.
 - j. Contact monitoring devices.
 - k. Releasing devices.
 - l. Addressable relays.
 - m. Addressable circuit interface modules.
- D. Evidence of designer qualifications.
- E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
- 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Figure A.10.6.2.3(9), and complete listing of software required.
 - 4. System zone boundaries and interfaces to fire safety systems.
 - 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 - 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 - 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 - 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 - 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
 - 11. Detailed aspirating smoke detection system calculations, drawings and diagrams:
 - a. System summary information including tabulated information on each system pipe length, number of sampling holes, hole spacing, hole % balance and % share, and transport times.
 - b. Pipe network layouts including isometric and wiring diagrams. Calculations shall be provided from a registered air sampling pipe modeling program (ASPIRE2 version 1.21.01 or later).
 - c. System design calculations, installation standards and Commissioning forms.
 - 14. Certification by Contractor that the system design complies with the contract documents.
- F. Evidence of installer qualifications.
- 2. Copy of current active State of Florida Alarm Contractor 1 EF License and National Institute for Certification in Engineering Technologies (NICET) certifications, minimum Level II for all installation technicians. All personnel shall be fire alarm system agent (FASA) certified as required by F.S. 489.5185 and F.S. 633.702(4). All personnel shall have in their possession a current valid FASA card and produce it for inspection upon request by owners representative.
- G. Evidence of instructor qualifications; training lesson plan outline.
- H. Evidence of maintenance contractor qualifications, if different from installer.
- I. Inspection and Test Reports:
- 1. Submit inspection and test plan prior to closeout demonstration.
 - 2. Submit documentation of satisfactory inspections and tests.

- J. Operating and Maintenance Data: See Section 01 78 23 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
 - 1. Complete set of specified design documents, as approved by authority having jurisdiction.
 - 2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 - 3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
 - 4. List of recommended spare parts, tools, and instruments for testing.
 - 5. Replacement parts list with current prices, and source of supply.
 - 6. Detailed troubleshooting guide and large scale input/output matrix.
 - 7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
 - 8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- K. Project Record Documents: See Section 01 78 39 for additional requirements; have one set available during closeout demonstration:
 - 1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 - 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 - 3. "As programmed" operating sequences, including control events by device, updated input/output matrix, and voice messages by event.
 - 4. Provide laminated color scaled floor plans of the facility showing the location of all initiating devices and / or zones, including the coverage of all aspirating smoke detectors.
 - 5. Submit three copies of final project record documents.
- L. Closeout Documents:
 - 1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 - 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
 - 3. Certificate of Occupancy.
- M. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
 - 1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and deliver to owner's representative.
 - 2. Submit three copies of closeout documents.

1.05 QUALITY ASSURANCE

- A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.
- B. Manufacturer's Qualifications: Company specialized in manufacturing the products specified in this section for minimum 10 years.
 - 1. Name of manufacturer, part number, and serial number shall appear on all major components.
 - 2. Products: Furnish products listed and classified by Underwriter's Laboratories Inc. or approved nationally recognized testing laboratories (NRTL) as suitable for the purpose specified and indicated.
 - 3. All major system components shall be new and standard products of a single manufacturer. Certain individual components, as noted in this specification, may be supplied by other manufacturers.

- C. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- D. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
 - 1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 - 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
 - 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
 - 4. Certified in the State in which the Project is located as fire alarm installer.
 - 5. Show evidence of a minimum two million dollar liability and completed operations insurance policy. These limits supercede limits required elsewhere in this specification.
 - 6. Proof of emergency service availability 24 hours a day, seven days a week.
- E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- F. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.06 EXTRA MATERIALS AND TOOLS

- A. In addition to the items in quantities indicated in PART 2, provide the following:
 - 1. CD-ROM copies, 2, of all software not resident in read-only-memory.
 - 2. Fuses, 2 for each installed fuse; store inside applicable control cabinet.

1.07 WARRANTY

- A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Fire Alarm Control Units - Basis of Design:
 - a. Siemens Building Technologies, Inc.
 - b. Silent Knight
 - c. Edwards/Notifier
- B. Initiating Devices, and Notification Appliances:
 - 1. Siemens Building Technologies, Inc:
 - 2. Silent Knight
 - 3. Edwards/Notifier
- C. Miscellaneous items: Manufacturers as noted below for each individual product.

2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a new automatic micro processor based fully addressable fire detection and alarm system capable of communicating and controlling addressable analog devices and sensors.

1. Provide all components necessary, regardless of whether shown in the contract documents or not.
2. Protected Premises: Entire building shown on drawings.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. The Americans With Disabilities Act (ADA).
 - c. The requirements of the local authority having jurisdiction.
 - d. Applicable local codes.
 - e. The contract documents (drawings and specifications).
 - f. NFPA 101.
 - g. NFPA 72; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
 - h. System shall meet NFPA 72 requirements as a calibrated smoke sensitivity fixture.
4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
5. Control Functions: All control functions shall be activated within three seconds after receipt of alarm condition for a fully loaded system. Response times measured from activation of initiating device to activation of associated notification appliance circuit.
6. Malfunctions and False Alarms: Shall not occur from any automatic sensor due to electrical noise such as high frequency pulses or electromagnetic influences emitted from other electronic equipment.
10. Hearing Impaired Occupants: Provide visible notification devices in all public areas.
11. Combined Systems: Do not combine fire alarm system with other non-fire systems.
12. Programming and system configuration:
 - d. Provide a Learn or Compare Mode to identify changes in the installed system with the system configuration. Identified changes will then be presented to the user for validation. The Learn or Compare Mode shall also provide a means to program groups of devices with the same operating characteristics to minimize configuration times and errors.
 - e. Capable of sensitivity settings of each sensor based on time of day and day of week.
 - f. A copy of all software documentation shall be maintained on the construction site in a binder, arranged in chronological order. This binder shall be turned over to Owner after all start up, testing, commissioning, programming and demonstrations are completed.
 - g. Once the fire alarm system is put into service, in whole or in part, no software changes shall be performed without written consent of Owner. If software changes are needed, they shall be performed by certified manufacturer's technicians.
14. Local network:
 - a. An addressable network shall provide communications with all initiating and control devices individually. Control panel annunciation for each device shall include alarm, trouble, open, short, ground, device fail or incorrect device.
 - b. All addressable devices shall have the capability of being disabled or enabled individually.
 - c. Each device shall be identified by a unique address code.
 - d. Communication format shall be a fully digital poll/response type protocol. Communications reliability shall be obtained by using parity data bit error checking routines for address codes and sum routines for data transmission protocol.

2.04 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervisory Alarm: Provide supervisory signals in accordance with NFPA 72 for the following:
 1. Sprinkler water control valves.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
 1. Sprinkler water flow.

3. Duct smoke detectors: Close dampers indicated; shut down air handlers indicated.
- D. System Control Outputs:
 1. HVAC:
 - a. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.05 COMPONENTS

- A. General:
 - b. System activation shall be initiated by one smoke sensor (with alarm verification) or at aspirating smoke detection Pre-Alarm Level 2. Subsequent device activation of same device or devices in adjacent zones will not change system operation.
 - c. System activation shall be initiated by one smoke sensor (with alarm verification) or at aspirating smoke detection Action Level 2. Subsequent device activation of same device or devices in adjacent zones will not change system operation.
 - d. All normal HVAC air handling systems serving the building shall shut down upon initiation of a smoke sensor anywhere in that zone.
 - e. Initiation of smoke detection system or smoke sensor in a smoke zone shall simultaneously activate all indicated make up air damper openings.
- E. Initiating Devices:
 1. Manual Pull Stations:
 - a. Addressable single action, mechanically latching, manual resetting type.
 - b. Durable high impact construction, red with white lettering.
 - c. Front of station shall be hinged to a backplate assembly and must be opened with a key to reset. Key shall be common with the FACP. Allen wrenches or special tools to reset are not acceptable.
 - d. Products:
 - 2) Siemens Building Technologies, Inc. HMS-S.
 - 3) Outdoor pull station: Siemens Building Technologies, Inc. MSM-K-WP with HTRI-S addressable contact module located in conditioned space.
 - e. Each pull station shall be provided with a breakglass safety cover with spacer and mounting hardware.
 - 1) For interior dry locations:
 - (b) Product: Safety Technology International STI-4130.
 - 2) For exterior damp or wet locations:
 - (b) Product: Safety Technology International STI-4130 with STI-3002 weather gasket.
 - f. Provide 1 extra each of a manual pull station and 3 extra breakglass safety covers.
 2. Smoke Sensors (Detectors):
 - a. Analog Multi Criteria (Heat or Smoke) Sensors:
 - 1) Each sensor shall store the sensor address and operating characteristics in non volatile memory at the sensor. Sensor shall use a threshold received from the control unit to determine when an alarm condition exists.
 - 2) Each sensor shall have alarm LED's for viewing. The alarm LED's shall flash when communicating with the control panel and shall change state during alarm conditions.
 - 3) Each sensor shall be capable of compensating for dust and dirt accumulation within the sensor chamber.
 - 4) Sensor shall combine photoelectric smoke sensing and heat sensing principles within one housing.
 - 6) Products:
 - (a) Sensor head: Siemens Building Technologies, Inc. HFP-11. Sensor head factory or field painted black per manufacturer's requirements as noted on drawings.

- (b) Addressable sensor base: Siemens Building Technologies, Inc. DB-11.
Sensor bases factory or field painted black per manufacturer's requirements
 - (c) Addressable sensor base with relay: Siemens Building Technologies, Inc. DB-HR. Sensor bases factory or field painted black per manufacturer's
 - 7) Provide 3 extra each of sensor and sensor base.
- b. Air Duct Smoke Sensors (Detectors) and Accessories:
 - 1) Analog photo sensors shall be utilized at all air duct monitoring locations.
 - 2) Sampling tubes to suit specific duct sizes. Continuous cross sectional sampling of air with supply and return air tubes which average the effects of laminar flow, stratification or skin effect phenomena.
 - 3) Sampling tubes shall be listed by the manufacturer for the specific detector used.
 - 6) Air duct sensor housing mounted directly to ducting system. Ducting system supplied with access panels for sampling tube maintenance. Duct sensor locations shall be coordinated and confirmed by Walt Disney World Company, Facility Systems Department.
 - 7) Relay output provision to operate supplementary equipment as noted.
 - 9) Products:
 - (a) Sensor head: Siemens Building Technologies, Inc. HFP-11.
 - (b) Addressable sensor base: Siemens Building Technologies, Inc. DB-11.
 - (c) Air duct sensor housing: Siemens Building Technologies, Inc. AD-11P.
 - (d) Air duct sensor housing with relay: Siemens Building Technologies, Inc. AD-HR.
 - (e) Weatherproof air duct sensor housing: Siemens Building Technologies, Inc. WP-2000.
 - (f) Sampling tubes: Siemens Building Technologies, Inc. STA series.
 - (g) Remote alarm indicator: Siemens Building Technologies, Inc. RLW-11.
 - 10) Provide 1 extra each of sensor, sensor base and housing.
- 3. Analog Thermal Sensors (Heat Detectors):
 - a. Each sensor shall store the sensor address address and operating characteristics in non volatile memory at the sensor. Sensor shall use a threshold received from the control unit to determine when an alarm condition exists.
 - b. Each sensor shall have alarm LED's for viewing. The alarm LED's shall flash when communicating with the control panel and shall change state during alarm conditions.
 - d. The set point for the thermal sensor shall be 135° F (38° to 57.2° C). The thermal detector shall be capable of operating on either a fixed temperature principle or rate of rise principle.
 - f. Products:
 - 1) Sensor head: Siemens Building Technologies, Inc. HFPT-11.
 - 2) Addressable sensor base: Siemens Building Technologies, Inc. DB-11.
 - g. Provide 3 extra each of sensor and sensor base.
- 4. Addressable Circuit Interface Modules:
 - a. Arrange to monitor or control one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of water flow, valve tamper, non-addressable devices, and for control of air handling equipment. Modules shall be mounted in a standard 4" square electrical outlet box and will include cover plates to allow for surface or flush mounting. Modules shall receive their operating power from the signaling line circuit. The following types of modules shall be used:
 - b. Monitor Circuit Interface Output Module (Type 1):
 - 1) Each supervised output module shall be rated to operate listed notification appliances.
 - 2) Circuit shall be rated for 2.0 amps at 24VDC.
 - 3) Each module shall store the sensor address and operating characteristics in non volatile memory at the module.

- 4) Each module shall be individually selectable for silencing and walktest. A module programmed to operate during walktest will initiate the programmed pattern for 4 seconds when the appropriate initiating conditions are satisfied.
 - 5) Each module shall operate under up to 16 different conditions occurring in the system. These conditions include combining various zones and zone states.
 - 7) Products:
 - (a) Siemens Building Technologies, Inc. HCP.
 - c. Monitor Circuit Interface Input Modules (Type 2):
 - 1) Contact modules shall provide monitoring of dry contacts as initiating devices.
 - 2) Each module shall store the sensor address and operating characteristics in non volatile memory at the module.
 - 3) Mount module to a standard junction box and provide visual indication of status via status LED's. Optional mounting shall be available to allow mounting the
 - 5) Products:
 - (a) Siemens Building Technologies, Inc. HTRI-S (single input) or HTRI-D (dual input) or HTRI-M (single input).
 - d. Single Address Multi Point Input Modules (Type 3):
 - 1) Dual Input with Single Relay Output:
 - (a) Input to provide monitoring of two supervised dry contact initiating circuits and supply a single relay output from a single address.
 - (b) Simplex relay (IAM) 4090-9118 (CSFM # 7300-0026:311) with 4090-9802 trim plate for LED viewing in a surface mounted box.
 - 2) Single Input with Single Relay Output:
 - (a) Input to provide monitoring of an supervised dry contact initiating circuits and supply a single relay output from a single address.
 - (b) Simplex relay (IAM) 4090-9119 (CSFM # 7300-0026:311) with 4090-9802 trim plate for LED viewing in a surface mounted box.
 - 3) Four Inputs with Dual Relay Outputs:
 - (a) Inputs to provide monitoring of four supervised dry contact initiating circuits and supply two relay outputs from a single address.
 - (b) Simplex relay (IAM) 4090-9120 (CSFM # 7300-0026:311) with 4090-9802 trim plate for LED viewing in a surface mounted box.
 - e. Line Powered Control Circuit Relay Module (Type 4):
 - 1) Module shall provide control and status tracking of a Form "C" contact.
 - 2) Module shall provide independently operating and configurable relay.
 - 3) Relay shall be rated for 2.0 amps at 24 VDC.
 - 4) Each module shall store the sensor address and operating characteristics in non volatile memory at the module.
 - 5) Each module shall operate under up to 16 different conditions occurring in the system. These conditions include combining various zones and zone states.
 - 6) Module shall operate relay without requiring a separate power source.
 - 8) Product: Siemens Building Technologies, Inc. HTRI-R.
- F. Notification Appliances:
1. Bells:
 - a. 10 inch diameter 120VAC polarized red vibrating outdoor type with minimum audible signal output level of 88 dBA at 10 feet.
 - b. Product:
 - 1) Wheelock 43T-G10-115-R.
 - 2) Gentex GB10-120.
 - 3) Siemens Building Technologies, Inc. BT-AC.
 2. Horns:
 - a. Low current 24VDC multi tone electronic type, red housing with white lettering.
 - b. Sound output of 80 - 85 dBA at 10 feet.
 - d. Product: Siemens Building Technologies, Inc. U-MMT-1G-W.

3. Speaker/Strobes:
 - a. Visual addressable strobe unit meeting NFPA/ANSI standards and ADA Accessibility Guidelines.
 - b. Strobe selectable settings of 15, 75, or 110 candela for ADA compliance, 24VDC with minimum flash rate of 1 flash per second over regulated voltage range.
 - c. Speaker with selectable input of either 25 or 70V RMS, selectable power taps from 1/4 watt to 2 watts, frequency response of 400 to 4000 Hz, and sound output of up to 98 dBA at 10 feet.
 - d. Wall mount or ceiling mount with white faceplate.
 - f. Product: Gentex HS24-15/75WW (ADA compliant).
 - g. Where higher strobe settings are required, a selectable strobe setting unit with settings of 15, 30, 75, 110 candela shall be used.
 - 1) Product: Wheelock NS-24MCW-FW (selectable strobe outputs).
 - h. Weatherproof unit: Gentex WGES-75WW.
4. Strobes:
 - a. Non addressable meeting requirements of NFPA/ANSI standards and ADA Accessibility Guidelines.
 - b. Strobe settings of 15/75 candela for ADA compliance, 24VDC with minimum flash rate of 1 flash per second over regulated voltage range.
 - d. Product: Siemens Building Technologies, Inc. U-MCS-W (white body).
5. Synchronization Control Modules:
 - a. Dual output type for control of either Class A or Class B notification appliance circuits.
 - b. Ability to silence horn or speaker but maintain strobe flash.

2.06 CONDUIT AND CABLE

- A. Conduit
 1. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40% of the interior cross sectional area where three or more cables are included within a single conduit.
 2. Separate cables from any open conductors of Class 1 circuits and do not place in any conduit, junction box, or raceway containing Class 1 cables.
 3. Wiring for low voltage control, alarm notification, emergency communications, and similar power limited auxiliary functions may be installed in the same conduit as initiating an signaling line circuits.
 4. Conduits shall not enter the control panel or any other component provided except where entry is specified by the manufacturer.
 5. Conduit shall be minimum 3/4 inch (20 mm).
- B. Cable
 1. Conductor size shall not be less than 18 AWG for initiating devices or signaling line circuits and 14 AWG for notification appliance circuits.
 2. All wiring shall be supervised for open circuits, short circuits, and grounded conditions.
 3. Cross sectional area of wiring shall be selected to limit voltage drop to less than 10% of nominal voltage for devices which require higher currents (alarm horns, bells, and sirens).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.
 1. No smoke sensors shall be located with 60 inches of any supply or return air ducts.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

- E. Aspirating smoke detection:
 - 1. Air sampling pipe shall be supported at not less than 5 foot centers.
 - 2. All joints in air sampling pipe shall be air tight and made by using solvent cement, except at entry to the detector. Glue shall be applied to pipe ends only and pressed into dry fittings and rotated, to avoid build up of glue inside the pipe connection.
 - 3. The far end of each sampling pipe shall be fitted with an end cap and drilled with a hole appropriately sized to achieve the performance as calculated by the system design. This end cap shall be located at no more than 60" above finished floor for ease of maintenance access and system testing.
 - 4. Sampling hole size shall be calculated based on transport time of smoke sampled from the farthest sampling point to reach the detector with an allowable transport time of less than 120 seconds. U.L. listed for use in plenum spaces.
 - 5. Each sample hole shall be chamfered on the exterior edge by countersinking the hole with a larger drill bit size to reduce debris build up around the sample hole.
 - 6. Each sampling pipe shall have a socket union installed 12" above the Hoffman enclosure to allow for disconnection and cleaning of the sampling pipe.
 - 7. Each sampling pipe shall have an inline filter installed as a prefilter before the socket union.
 - 8. Each back of house (BOH) sampling point shall be identified utilizing Vesda E700-SP-DCL labels. No other labeling method shall be accepted.
- F. Painting of devices:
 - 1. Horn/Strobe assembly bodies:
 - a. Field painting of specific devices shall be required as noted on drawings.
 - b. When painting the device body, the body should be removed and painted to avoid damage and/or coating of speaker.
 - c. If the word "FIRE" is located on the strobe, then the entire device body can be painted.
 - d. If the word "FIRE" is located on the sides of the device, the face with the word "FIRE" cannot be painted but remaining body can be painted.
- A. Notify Owner 14 days prior to beginning completion inspections and tests.
- B. Owner will provide the services of an independent fire alarm engineer or technician to observe all tests.
- C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- D. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- E. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- F. Provide all tools, software, and supplies required to accomplish inspection and testing.
- H. System start up and commissioning shall include trial operation of all main and peripheral equipment and software programming of local FACP.
- I. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- J. Proper air duct sensor air flow shall be demonstrated using manufacturer's approved test equipment. Documentation of air flow velocity shall be provided and shall include velocity, air handler name, sensor location, manufacturer and model number of testing device. This testing shall be conducted after the air handling system's testing and balancing work has been completed.
- K. One Man Walk Test with History Logging
 - 1. System shall be capable of being tested by one person. While in test mode, the alarm activation of an initiating device circuit shall be silently logged in the history data log. FACP shall automatically reset after logging of the alarm.

2. Momentary disconnection of an initiating or indicating device circuit shall be logged as a trouble condition in the history data log. FACP shall automatically reset after logging of the trouble condition.
3. Optionally, the walk test sequence will have the capability of activating the alarm indicating appliances for a maximum of 2 seconds. If this option is selected, any momentary opening of an initiating or indicating appliance circuit's wiring shall cause the alarm indicating appliances to sound for 4 seconds to indicate a trouble condition.
4. Walk test feature shall revert to normal mode automatically if the feature is activated for an inappropriate amount of time. Set time as directed by local authority having jurisdiction.
5. The FACP shall be capable of supporting up to eight separate testing groups whereby one group of points may be in a testing mode and other (nontesting) groups may be active and operate as programmed per normal system operation. After testing is complete, testing data may be retrieved from the system in chronological order to ensure device/circuit activation.
6. Should an alarm condition occur from an active point not in walk test mode, it shall perform all standard programmed alarm sequences.
7. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.
8. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
 - a. Record all system operations and malfunctions.
 - b. If a malfunction occurs, start diagnostic period over after correction of malfunction.
 - c. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
 - d. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated Owner personnel:
 1. Hands-On Instruction: On-site, using operational system.
- B. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
 1. Initial Training: 1 session pre-closeout.

3.04 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 1. Be prepared to conduct any of the required tests.
 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 4. Proper strobe candela settings shall be adjusted and confirmed with authority having jurisdiction during system commissioning.
 5. Repeat demonstration until successful.
- B. Occupancy of the project will not occur prior to Substantial Completion.
- C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
 1. Specified diagnostic period without malfunction has been completed.
 2. Approved operating and maintenance data has been delivered.
 3. Spare parts, extra materials, and tools have been delivered.
 4. All aspects of operation have been demonstrated to Owner.

5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
6. Occupancy permit has been granted.
7. Specified pre-closeout instruction is complete.

3.05 MAINTENANCE

- A. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.
- B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
 1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
 2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
 3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- C. Provide trouble call-back service upon notification by Owner:
 1. Provide on-site response within 2 hours of notification.
 2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
 3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- D. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- E. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.
- F. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil treatment with termiticide.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the EPA-Registered Label for termiticide products.
- B. Product certificates.
- C. Soil Treatment Application Report: Include the following:
1. Date and time of application.
 2. Moisture content of soil before application.
 3. Termiticide brand name and manufacturer.
 4. Quantity of undiluted termiticide used.
 5. Dilutions, methods, volumes used, and rates of application.
 6. Areas of application.
 7. Water source for application.
- D. Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.
- B. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
- B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.5 WARRANTY

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Warranty Period: Shall be transferrable and effective for Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Corporation, Agricultural Products; Termidor.
 - b. Bayer Environmental Science; Premise 75.
 - c. FMC Corporation, Agricultural Products Group; Dragnet FT.
 - d. Syngenta; Demon TC.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.2 APPLYING SOIL TREATMENT

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
- B. Proceed with application only after unsatisfactory conditions have been corrected.
- C. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.
- D. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
1. Slabs-on-Grade and Basement Slabs: Underground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- E. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- F. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- G. Post warning signs in areas of application.
- H. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 313116

SECTION 313132 - SUBSURFACE INVESTIGATION – GEOTECHNICAL DATA

PART 1 - GENERAL

- 1.1 This section describes soils investigation at the site, and use of data resulting from that investigation.
- A. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - B. Soils Investigation Report
 - 1. General:
 - a. The Owner has authorized a soils investigation report for this site. The report was prepared by Terracon Consultants, Inc. Terracon Project Number H4215044A, dated May 11, 2022.
 - b. A copy of the soils investigation report, including addendums, is attached hereto for reference only, and is NOT a part of this Project Manual to be covered by the Architect's seal.
 - 2. Use of data:
 - a. This report was obtained only for the Architect's use in design and is not a part of the Contract Documents.
 - b. The report is available for bidders' information, but is not a warranty of subsurface conditions.
 - c. Bidders should visit the site and acquaint themselves with existing conditions.
- 1.2 Quality Assurance
- A. A soils testing laboratory will be retained by the Owner to observe performance of work in connection with excavation, trenching, filling, backfilling, and grading, and to perform compaction tests.
 - B. Readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written approval from the Architect.
 - C. Refer Continuation Pages of Geotechnical Engineer's Report

END OF SECTION 313132