

SECTION 074113.16 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section includes metal roof panels.
- B. Related Sections:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 074293 "Soffit Panels" for metal panels used in horizontal soffit applications.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose

work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Sustainable Design Submittals:

1. Product Test Reports: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirements.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel 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: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace 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. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.

- B. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 or initial SRI not less than 82 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- C. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low-slope roof products.
- D. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- E. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E1680 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- F. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
- G. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.
- H. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: As indicated on drawings.
- I. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 - 1. Fire/Windstorm Classification: Class 1A- As indicated on structural drawings.
 - 2. Hail Resistance: MH.
- J. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 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.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide PBR by MBCI or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be as noted on drawings and selected from manufacturer's full range of products.
 - 1. AEP Span
 - 2. MBCI
- C. Basis of Design Product: Subject to compliance with requirements, provide Products as noted in drawings or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products.
 - 1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: 24 ga
 - b. Exterior Finish: PVDF.
 - c. Color: Polar White.
 - 2. Panel Coverage: Manufacturers standard for product noted on drawings.
 - 3. Panel Height: Manufacturers standard for product noted on drawings.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.

2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels, roof fascia and rake trim.
- E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot-long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.
- F. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, 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. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. 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.
- E. 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. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. 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 by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to

exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.

2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed 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 weather resistant.
1. Install exposed flashing and trim that is without 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 achieve waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
1. Provide elbows at base of downspouts to direct water away from building.
 2. Connect downspouts to underground drainage system indicated.
- J. Roof Curbs: Install flashing around bases where they meet metal roof panels.
- K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.4 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

SECTION 074213.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Concealed-fastener, lap-seam metal wall panels.
- B. Related Sections:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 074293 "Soffit Panels" for metal panels used in horizontal soffit applications.

1.3 PREINSTALLATION MEETINGS

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

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review of procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.

1. Include Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical metal panel assembly as shown on Drawings, including corner, soffits, supports, attachments, and accessories.
 - 2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
 - 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 components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.

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

- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

- 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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 on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product

named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

1. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

- C. Reveal-Joint, Concealed-Fastener Metal Wall Panels: Formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with narrow reveal joint between panels.

1. Basis-of-Design Product: Subject to compliance with requirements, provide T10A by Metal Sales or comparable product by one of the following. The Design Intent of this selection is to match existing metal wall panels located on other building on the LPOE site. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products:

- a. **ATAS International, Inc.**
- b. **Metal Sales Manufacturing Corporation.**
- c. **PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.**

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. Thickness: Manufacturer's standard.
- b. Surface: Smooth, flat finish.
- c. Exterior Finish: As indicated on drawings.

3. Panel Coverage: 28 inches.
4. Panel Height: 1.5 inch.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or

premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, 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. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. 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.
- E. 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. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. 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 by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Aluminum Panels and Accessories:
 1. Metallic Fluoropolymer: AAMA 2605. Three-coat fluoropolymer finish with suspended metallic flakes 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, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 - 1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 - 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 - 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 - 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 - 5. Flash and seal panels with weather closures at perimeter of all openings.
- E. Watertight Installation:
 - 1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
 - 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - 3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
 - 1. Install exposed flashing and trim that is without 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 achieve waterproof performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of

corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.13

SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section includes metal soffit panels.
- B. Related Sections:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 074113.13 "Formed Metal Roof Panels" for lap-seam metal roof panels.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-

formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including fascia, and soffit as shown on Drawings; approximately four panels wide by full eave width, including attachments and accessories.
 - 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.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel 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: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 PERFORMANCE REQUIREMENTS

- A. **Recycled Content:** Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft.

- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.3 METAL SOFFIT PANELS

- A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide FW-120 prefinished soffit panel by MBCI or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products.
- C. Reveal-Joint-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and between panel edges; with recessed reveal joint between panels.
 - 1. Panel Sheet: Coil-coated sheet as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Thickness: 24 ga.
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: PVDF.
 - d. Color: Polar White.
 - 2. Panel Coverage: Based upon selected panel type by architect.
 - 3. Panel Height: Based upon selected panel type by architect.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, 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. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. 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.

- E. 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 Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 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 by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
 - 3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
 - 2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.
 - a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.
 - 1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels.
 - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.

5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
 2. Stainless-Steel Panels: Use stainless-steel fasteners.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
- E. Watertight Installation:
1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide

concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without 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 achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074293

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Manufactured reglets with counterflashing.
 - 2. Formed roof-drainage sheet metal fabrications.
 - 3. Formed low-slope roof sheet metal fabrications.
 - 4. Formed wall sheet metal fabrications.
 - 5. Formed equipment support flashing.
 - 6. Formed overhead-piping safety pans.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.

3. Section 077100 "Roof Specialties" for manufactured copings, roof-edge specialties, roof-edge drainage systems, reglets, and counterflashings.
4. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 3. Review requirements for insurance and certificates if applicable.
 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following
 1. Underlayment materials.
 2. Elastomeric sealant.
 3. Butyl sealant.
 4. Epoxy seam sealer.
- 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 1-1/2 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.
 4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For copings and roof edge flashing, from showing compliance with ANSI/SPRI/FM 4435/ES-1.
- E. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

- B. Special warranty.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
 - 1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof edge eave, including built-in gutter fascia fascia trim, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner 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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
 - 1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
 - 2. Protect stored sheet metal flashing and trim from contact with water.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

- a. Color fading more than 5 Delta units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. SPRI Wind Design Standard: Manufacture and install copings roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
 1. Design Pressure: As indicated on Drawings.
- E. FM Approvals Listing: Manufacture and install copings roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A755/A755M.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.
 - 2. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.
 - 3. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
 - 4. Color: As selected by Architect from manufacturer's full range.
 - 5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- C. Zinc Sheet: Zinc, 99 percent pure, alloyed with 0.08 to 1.00 percent copper, 0.06 to 0.20 percent titanium, and up to 0.015 percent aluminum; with manufacturer's standard factory-applied, flexible, protective back coating.
 - 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. Jarden Zinc Products.
 - b. Rheinzink America.
 - c. Umicore Building Products USA, Inc.
 - 2. Source Limitations: Obtain sheet from single source from single manufacturer.
 - 3. Finish: Preweathered gray.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Self-Adhering, High-Temperature Sheet Underlayment: 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 in accordance with underlayment manufacturer's written instructions.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
 - b. Henry Company.
 - c. Owens Corning.
 - 2. Source Limitations: Obtain underlayment from single source from single manufacturer.
 - 3. Low-Temperature Flexibility: ASTM D1970/D1970M; 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 sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

- C. Solder:
1. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.
- I. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- J. 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, provide products by one of the following:
 - a. Fry Reglet Corporation.
 - b. Heckmann Building Products, Inc.
 - c. Hohmann & Barnard, Inc.
 2. Source Limitations: Obtain reglets from single source from single manufacturer.
 3. Material: Aluminum, 0.024 inch thick or Galvanized steel, 0.022 inch thick.
 4. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 5. 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.
 6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

7. 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.

8. Finish: With manufacturer's standard color coating.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

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

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

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

- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams:
 - 1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
 - 3. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters:
 - 1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
 - 2. Fabricate in minimum 96-inch-long sections.
 - 3. 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.
 - 4. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 - 5. Gutter Profile: Style A in accordance with cited sheet metal standard.
 - 6. Expansion Joints: Lap type.
 - 7. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
 - 8. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.
 - 9. Gutters with Girth 16 to 20 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.028 inch thick.
 - 10. Gutters with Girth 21 to 25 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.034 inch thick.

- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
 - 1. Fabricated Hanger Style: Fig. 1-35C in accordance with SMACNA's "Architectural Sheet Metal Manual."
 - 2. Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.
- C. Parapet Scuppers: Fabricate scuppers to dimensions required, 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. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch thick.
- D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricate interior and exterior corners.
 - 1. Joint Style: Overlapped, 4 inches wide.
 - 2. Fabricate with scuppers spaced 10 feet apart, to dimensions required with 4-inch-wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
 - 3. Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.
 - b. Galvanized Steel: 0.028 inch thick.
- B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
 - 1. Coping Profile: Fig. 3-4A in accordance with SMACNA's "Architectural Sheet Metal Manual."
 - 2. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
 - 3. Fabricate from the following materials:
 - a. Galvanized Steel: 0.040 inch thick.

- C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch thick.
- D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.022 inch thick.
- E. Flashing Receivers: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.022 inch thick.
- F. Roof-Penetration Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:
 - 1. Stainless Steel: 0.016 inch thick.
- B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick.
 - 2. Galvanized Steel: 0.022 inch thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 - 1. Stainless Steel: 0.019 inch thick.
 - 2. Galvanized Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

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

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

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

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder welds sealant.
 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
 6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 7. Do not field cut sheet metal flashing and trim by torch.
 8. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
 - d. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
 2. Do not solder metallic-coated steel and aluminum sheet.
 3. Do not pretin zinc-tin alloy-coated copper.
 4. Do not use torches for soldering.
 5. Heat surfaces to receive solder, and flow solder into joint.
 - a. Fill joint completely.
 - b. Completely remove flux and spatter from exposed surfaces.

6. Stainless Steel Soldering:

- a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
- b. Promptly remove acid-flux residue from metal after tinning and soldering.
- c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:

1. Join sections with joints sealed with sealant.
2. Provide for thermal expansion.
3. Attach gutters at eave or fascia to firmly anchor them in position.
4. Provide end closures and seal watertight with sealant.
5. Slope to downspouts.
6. Fasten gutter spacers to front and back of gutter.
7. Anchor and loosely lock back edge of gutter to continuous cleat.
8. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
9. 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.
10. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 feet apart. Install expansion-joint caps.
11. Install continuous gutter screens on gutters with noncorrosive fasteners, removable hinged to swing open for cleaning gutters.

C. Downspouts:

1. Join sections with 1-1/2-inch telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately 60 inches o.c.
4. Provide elbows at base of downspout to direct water away from building.
5. Connect downspouts to underground drainage system.

D. Parapet Scuppers:

1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

2. Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
 3. Loosely lock front edge of scupper with conductor head.
 4. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
- E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below scupper discharge.
- F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches in direction of water flow.

3.5 INSTALLATION OF ROOF FLASHINGS

- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing:
1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
 2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
 3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Copings:
1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
 2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
 - a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
 - b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
 3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 - 2. Extend counterflashing 4 inches over base flashing.
 - 3. Lap counterflashing joints minimum of 4 inches.
 - 4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 INSTALLATION OF WALL FLASHINGS

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.
- C. Reglets: Installation of reglets is specified in Section 042000 "Unit Masonry."

3.7 INSTALLATION OF MISCELLANEOUS FLASHING

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

3.8 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.10 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof-edge drainage systems.
 - 2. Reglets and counterflashings.
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 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. 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:

1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 3. Details of termination points and assemblies, including fixed points.
 4. Details of special conditions.
- C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- D. Samples for Verification: For roof-edge flashings roof-edge drainage systems reglets and counterflashing's made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Warranty: Sample of special warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For roofing specialties to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Pre-installation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, 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.
- 1.8 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 specialties installation.

1.9 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which 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 D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 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.

2.2 EXPOSED METALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.
 - 1. Surface: Smooth, flat finish.
 - 2. Exposed Coil-Coated Finishes: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 - b. Color: To match MBCI Signature 300 Metallic, Kynar 500- Silver Metallic

2.3 CONCEALED METALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.4 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. 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. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 - 3. 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 Coatings & Waterproofing; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- C. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

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. 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 Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

2.6 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. Castle Metal Products.
 - 3. Hickman Company, W. P.

4. [Metal-Era, Inc.](#)
5. [Metal-Fab Manufacturing, LLC.](#)

- B. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
1. Zinc-Coated Steel: Nominal 0.028-inch thickness.
- C. Zinc-Coated Steel Finish: Two-coat fluoropolymer.
1. Color: To match MBCI Signature 300 Metallic, Kynar 500- Silver Metallic.

2.7 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. [Castle Metal Products.](#)
 2. [Fry Reglet Corporation.](#)
 3. [Heckmann Building Products Inc.](#)
 4. [Hickman Company, W. P.](#)
 5. [Metal-Era, Inc.](#)
 6. [Metal-Fab Manufacturing, LLC.](#)
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
1. Zinc-Coated Steel: Nominal 0.028-inch thickness.
 2. Corners: Factory mitered and soldered.
 3. 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.
- 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. Zinc-Coated Steel: Nominal 0.028-inch thickness.
- D. Accessories:
1. 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 reglet is provided separate from metal counterflashing.
 2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
- E. Zinc-Coated Steel Finish: Two-coat fluoropolymer.

1. Color: To match MBCI Signature 300 Metallic, Kynar 500- Silver Metallic.

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

3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- B. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
- C. Polyethylene Sheet: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

- D. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

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, 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 watertight 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. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of self-adhering, high-temperature sheet underlayment.
 - 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 shown 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 will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches except reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow

solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.4 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. 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 downspout to direct water away from building.

3.5 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 elastomeric sealant. Fit counterflashings tightly to base flashings.

3.6 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 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Nonstaining silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Acoustical joint sealants.

1.3 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 masonry substrates.
- 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 application indicated below:
 - a. Each kind of sealant and joint substrate indicated.
 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 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 1. Joint-sealant application, joint location, and designation.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant formulation.

4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- D. Field-Adhesion Test Reports: For each sealant application tested.
- E. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. 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.
- E. Pre-installation Conference: Conduct conference at Project site.

1.7 PROJECT 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.

1.8 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish 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: 5 years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.

4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following :
 - a. Sika Corporation, Construction Products Division; Sikasil GP.
 - b. Tremco Incorporated; Spectrem 3.

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 - a. Tremco Incorporated; Spectrem 3.

2.4 URETHANE JOINT SEALANTS

- A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following :
 - a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
 - b. Tremco Incorporated; Vulkem 921.
 - c. BASF; MasterSeal NP 2

2.5 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following :
 - a. **Pecora Corporation**; AC-20 FTR.
 - b. **USG Corporation**; SHEETROCK Acoustical Sealant.

2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) , and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Masonry.
 - 3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.

2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 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 2 tests for the first 500 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform 1 test for each 500 feet of joint length thereafter or 1 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 C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 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 passes 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 fill, 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.

3.5 CLEANING

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

3.6 PROTECTION

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

END OF SECTION 079200

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Shop priming flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work
 - 2. Section 088000 "Glazing" for glass view panels in flush wood doors.
 - 3. Section 099113 and 099123 "Interior and Exterior Painting" for field finishing doors.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.
- B. Sustainable Design Submittals:
1. **Environmental Product Declaration:** For each product.
 2. **Health Product Declaration:** For each product.
 3. **Sourcing of Raw Materials:** Corporate sustainability report for each manufacturer.
 4. **Chain-of-Custody Certificates:** For certified wood products. Include statement of costs.
 5. **Chain-of-Custody Qualification Data:** For manufacturer and vendor.
 6. **Laboratory Test Reports:** For adhesives, indicating compliance with requirements for low-emitting materials.
 7. **Laboratory Test Reports:** For composite wood products, indicating compliance with requirements for low-emitting materials.
- 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 the following:
1. Dimensions and locations of blocking.
 2. Dimensions and locations of mortises and holes for hardware.
 3. Dimensions and locations of cutouts.
 4. Undercuts.
 5. Requirements for veneer matching.
 6. Doors to be factory finished and finish requirements.
 7. Fire-protection ratings for fire-rated doors.
- D. Samples for Initial Selection: For factory-finished doors.
- E. Samples for Verification:
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
 2. Plastic laminate, 6 inches square, for each color, texture, and pattern selected.
 3. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Provide Samples for each color, texture, and pattern of plastic laminate required.
 - c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

4. Louver blade and frame sections, 6 inches long, for each material and finish specified.
5. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. **Manufacturer Qualifications:** A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. **Vendor Qualifications:** A vendor that is certified for chain of custody by an FSC-accredited certification body.
- C. Comply with requirements of referenced standard and manufacturer's written instructions.
- D. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- E. Mark each door on bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.9 WARRANTY

- A. Special Warranty: 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. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Basis of design: Mohawk Doors; a Masonite company. 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. Ampco.
 2. Oshkosh Door Company.
 3. Maverick Door and Millwork, Inc.
 4. Steves Doors
 5. VT Industries
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
- A. **Regional Materials:** Wood doors shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
- B. **Certified Wood:** Wood doors shall be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004.
- C. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.
2. Extra Heavy Duty: public toilets, janitor's closets, assembly spaces, department doors, and other high traffic areas.
3. Standard Duty: Closets (not including janitor's closets).

E. Interior Solid-Core Doors :

1. Grade: Custom (Grade A faces).
2. Species: Douglas Fir.
3. Cut: Rotary cut.
4. Match between Veneer Leaves: Slip match.
5. Exposed Vertical and Top Edges: Same species as faces or a compatible species - edge Type A.
6. Core: Glued wood stave.
7. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
8. WDMA I.S.1-A Performance Grade: Extra Heavy Duty and Heavy Duty.

2.3 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. 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, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.4 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099110 "Exterior Painting and Interior Painting."

- B. Doors for Transparent Finish: Shop prime faces and all four edges with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing." Seal edges of cutouts and mortises with first coat of finish.

2.5 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
 - 1. Door finish shall be equal Mohawk Doors Rotary Natural Birch.
- C. Transparent Finish:
 - 1. Grade: Custom.
 - 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish.
 - 3. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door & Finish Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated doors according to NFPA 80.
 - 2. Install smoke- and draft-control doors according to NFPA 105.

- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Service doors.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work
 - 2. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.
 - 3. Section 099113 and 099123 "Exterior and Interior Painting" for finish painting of factory-primed doors.

1.3 ACTION SUBMITTALS

- A. 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.
- B. 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.
- C. 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.
- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 - 1. Curtain slats, including full vision window secured to slat.
 - 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

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

1.6 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.
- B. Sound-Control Doors: Assemblies tested in a laboratory for sound-transmission-loss performance according to ASTM E 90, calculated according to ASTM E 413, and rated for not less than the STC value indicated.

1.7 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: Two years from date of Substantial Completion.

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 E 330/E 330M or DASMA 108 for garage doors and complying with acceptance criteria of DASMA 108.

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.

2.3 DOOR ASSEMBLY

- A. Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation contact Ken Marbach (210) 655-8600 or (210) 669-2900; 620 Series Coiling Doors or comparable product by one of the following:
 - a. Wayne Dalton
 - b. Raynor
- 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 E 283.
- D. STC Rating: 26.
- E. Door Curtain Material: Aluminum.
- F. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
 1. Vision Panels: Approximately 10- by 1-5/8-inch openings spaced approximately 2 inches apart and beginning 12 inches from end guides; in three rows of slats at height indicated on Drawings; installed with vision-panel glazing.
 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: Galvanized steel with exposed finish matching curtain slats.
- I. Hood: Match curtain material and finish.
 1. Shape: Round.
 2. Mounting: Face of wall.
- J. Locking Devices: Equip door with locking device assembly and chain lock keeper.
 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumbturn outside with cylinder.

- K. Manual Door Operator: Chain-hoist operator.
 - 1. Provide operator with through-wall shaft operation.
 - 2. Provide operator with manufacturer's standard removable operating arm.
- L. Curtain Accessories: Equip door with weatherseals.
- M. Door Finish:
 - 1. Aluminum Finish: Clear anodized.
 - 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 B 209 sheet or ASTM B 221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch; and as required.
 - 2. Vision-Panel Glazing: Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet or fire-protection-rated glass as required for type of door; set in glazing channel secured to curtain slats.
- 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, and a continuous bar for holding windlocks.

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 B 209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
2. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

2.7 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. 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.
 2. Keys: Two for each cylinder.
- C. Chain Lock Keeper: Suitable for padlock.
- D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. 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, flexible, 1/8-inch-thick seals of flexible vinyl, rubber, or neoprene.
- C. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- D. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- E. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches high.
- F. Poll Hooks: Provide pole hooks and poles for doors more than 84 inches high.

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. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
 - 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic-closing device operates.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Lift handles and pull rope for raising and lowering doors, with counterbalance mechanism designed so that required lift or pull for door operation does not exceed 25 lbf.
- C. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.
- D. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit, of type indicated. Size gears to require not more than 25-lbf force to turn crank. Fabricate gearbox to be oiltight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

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. Mill Finish: Manufacturer's standard.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

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.

3.3 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. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
 - 3. Test door closing when activated by detector or alarm-connected automatic-closing system. Reset door-closing mechanism after successful test.

3.4 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.

3.5 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.

3.6 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 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section includes aluminum windows for exterior locations.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
 1. Include similar Samples of hardware and accessories involving color selection.
- E. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
 1. Exposed Finishes: 2 by 4 inches.
 2. Exposed Hardware: Full-size units.
- F. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Field quality-control reports.

- D. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows 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 window manufacturer for installation of units required for this Project.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum 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, condensation, 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.
 - c. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawaneer- Trifab 451 T or comparable product by one of the following:
1. EFCO Corporation; a Pella company.
 2. Kawneer North America; an Alcoa company.
 3. TRACO.
- B. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: AMMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: CW.
 - 2. Minimum Performance Grade: 30.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.32Btu/sq. ft. x h x deg F.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.
- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.
- F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F material surfaces.
- G. Sound Transmission Class (STC): Rated for not less than 45 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- H. Outside-Inside Transmission Class (OITC): Rated for not less than 30 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.
- I. Windborne-Debris Resistance: Capable of resisting impact from windborne debris based on testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 and requirements of authorities having jurisdiction.

2.3 ALUMINUM WINDOWS

- A. Operating Types: Provide the following operating types in locations indicated on Drawings:
 - 1. Fixed.
- B. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- C. Insulating-Glass Units: ASTM E 2190, certified through IGCC as complying with requirements of IGCC.
 1. Glass: ASTM C 1036, Type 1, Class 1, q3.
 - a. Tint: As indicated on drawings.
 - b. Kind: Fully tempered.
 2. Lites: Two.
 3. Filling: Fill space between glass lites with argon.
 4. Low-E Coating: Pyrolytic on second surface.
- D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
 1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- F. 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.

2.4 ACCESSORIES

- A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- B. Column Covers: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- C. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- D. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

- E. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.5 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- D. 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.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" 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: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 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: 2 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. Remove and replace noncomplying windows and retest as specified above.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 1. Keep protective films and coverings in place until final cleaning.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085113

SECTION 087100 – FINISH HARDWARE

PART 1 – GENERAL:

1.01 SUMMARY:

- A. Section includes the supply and installation of the Finish Hardware.
 - 1. Include the termination of all Electrified Hardware.
 - 2. Include field verification of any existing doors, frames or hardware.
- B. Related Sections
 - 1. Division 1
 - 2. Sealants – Division 7 / Division 7
 - 3. Openings – Division 8 / Division 8
 - 4. Finishes – Division 9 / Division 9
 - 5. Fire Alarm – Division 13 / Division 28
 - 6. Electrical – Division 16 / Division 26
 - 7. Security – Division 28

1.02 REFERENCES:

- A. Documents and Institutes that shall be used in estimating, detailing and installing the items specified.
 - 1. International Building Code – Current/Adopted Edition
 - 2. ICC/ANSI A117.1 – Accessible and Usable Building and Facilities - Current/Adopted Edition
 - 3. NFPA 70 – Current/Adopted Edition
 - 4. NFPA80 –Standards for Fire Doors and Fire Windows – Current/Adopted Edition
 - 5. NFPA101 – Life Safety Code – Current/Adopted Edition
 - 6. NFPA105 – Installation of Smoke-Control Door Assemblies – Current/Adopted Edition.
 - 7. ANSI - American National Standards Institute
 - 8. BHMA – Builders Hardware Manufacturers Association
 - 9. UL – Underwriters Laboratory
 - 10. DHI – Door and Hardware Institute
 - 11. Texas Accessibility Standards – Current Adopted Edition
 - 12. Local Building Codes

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Division 01.
- B. Finish Hardware Schedule to be in vertical format to include:
 - 1. Heading #/Hardware Set
 - 2. Door #, Location, Hand, Degree of Opening, Door Size and Type, Frame Size and Type, Fire Rating

3. Quantity, type, style, function, product, product number, size, fasteners, finish and manufacturer of each hardware item.
 4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 5. Keying schedule
 6. Title Sheet, Index, Abbreviations, Manufacturers List, Template List and Templates.
 7. Mounting locations for hardware.
 8. Explanation of abbreviations, symbols, and codes contained in schedule.
 9. Date of the Finish Hardware Specification and Drawing / Door Schedule used in completing the Finish Hardware Schedule.
 10. In Name, Company and Date of Field Verification if required.
 11. Door Index; include door number, heading number, and hardware group.
 12. Name and phone number for local manufacturer's representative for each product.
 13. Submit in conjunction with Door and Frame Submittal.
 14. Operation Description of openings with electrified hardware.
- C. LEED Submittals:
1. Refer to Division 1 for any LEED submittal requirements.
- D. Product Data: Provide product data in the form of a binder, manufacturer's technical product fact sheets for each item of hardware. Include whatever information may be necessary to show compliance with requirements, including instructions for installation and for maintenance of operating parts and finish.
- E. Wiring Diagrams: Provide Riser/Elevation and Point to Point Wiring Diagrams for all openings with electrified hardware. Include all information that is necessary for coordination with other trades.
- F. Samples: Provide samples as requested by Owner or Architect with Heading # and Door# marked on boxes. All samples will be returned to the contractor and used on doors for which they were marked.
- G. Templates: Provide templates of finish hardware items to each fabricator of doors, frames and other work to be factory or shop prepared for the installation of hardware.
- H. Keying Schedule: After meeting with the Owner, a keying schedule shall be submitted using keyset symbols referenced in DHI manual "Keying Systems and Nomenclature." The keying schedule shall be indexed by door number, keyset, hardware heading number, cross keying instructions and special key stamping instructions.
- I. Operations and maintenance data: At the completion of the job, provide to the Owner one hard copies or one electronic copy of an Owner's operation and maintenance manual. The manual shall consist of a labeled hardcover three ring binder with the following technical information:

1. Title page containing: Project name, address and phone numbers. Supplier's name, address and phone numbers.
2. Table of Contents.
3. Copy of final (file and field use/as-installed) Finish Hardware Schedule.
4. Final Keying Schedule.
5. Maintenance instruction, adjustment, and preservation of finishes for each item of hardware.
6. Catalog pages for each items of hardware.
7. Installation Instructions for each item of hardware
8. Parts List for each item of hardware.
9. As installed point to point wiring diagrams for electrified hardware.
10. Warranties include Order Number

1.04 QUALITY ASSURANCES

- A. Substitutions: Request for substitutions shall not be accepted within this project. Architect, Owner and Finish Hardware Consultant have selected one (1) specified and two (2) equals listed hereinafter in the Hardware Schedule. By this selection process they have established three (3) equal products for competitive pricing, while insuring no unnecessary delays by a substitution process. If any specified product is listed as a "No Substitution" product, this product will be supplied as specified, with no alteration or request of substitution. The reason for this is to comply with the uniformity established at this project. Parts and supplies are inventoried for these particular products for ease and standardization of replacement.
- B. Supplier Qualifications: Supplier shall be recognized architectural finish hardware supplier, with warehousing facilities, who have been furnishing hardware in the project vicinity for a period of not less than 2-year and who is or employs a DHI Certified AHC, DHC, DHSC or person with a minimum of 10 years of experience as a hardware supplier. This person shall be available at reasonable times during the course of the work for consultation about products hardware requirements, to the Owner, Architect and General Contractor.
- C. Installer Qualifications (Mechanical Hardware): All finish hardware shall be installed by the Finish Hardware Installer with a minimum of at least two (2) years documented experience. Installer shall attend a pre-installation meeting between the General Contractor, Finish Hardware Supplier/s, hardware manufacturer's representative for locks, closers and exit devices, and all door / frame suppliers. The Finish Hardware Installer shall be responsible for the proper installation and function of all doors and hardware.
- D. Installer Qualifications (Electrified Hardware): All electrified finish hardware (power source, electrified locking or control device, switching device, through wire device and monitoring device) shall be installed by an Electronic Access Control Installer licensed by the Texas Department of Public Safety. The Electrified Finish Hardware Installer shall have a minimum of at least two (2) years of documented experience. Installer shall attend a pre-installation meeting between the General Contractor, Finish Hardware

Supplier/s, Electrical Contractor, Fire Alarm Contractor, Security Contractor, hardware manufacturer's representative for electrified hardware, all door / frame suppliers. The Electrified Finish Hardware Installer shall be responsible for the proper installation, termination and function of all opening with electrified hardware. Installation shall include termination of all electrified products (including the required wire to the power supply and/or junction box).

1.05 DELIVERY, STORAGE AND HANDLING

- A. Marking and packaging: Mark each item or package separately, with identification related to hardware set number, door number and keyset symbol.
- B. Delivery:
 - 1. Deliver individually packaged and properly marked finish hardware at the proper time and location to avoid any delays in construction or installation.
 - 2. At time of delivery, inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- C. Storage: Store hardware in enclosed, dry and locked area.

1.06 WARRANTY

- A. All finish hardware products shall be covered by a 1-year factory warranty from the date of substantial completion of the project.
- B. Supply warranty verification to the owner for all products that provide factory warranty. Warranty should include Factory Order Number and date.

1.07 MAINTENANCE

- A. Maintenance Service
 - 1. None
- B. Extra Materials:
 - 1. All extra screws, fasteners, and all special installation tools furnished with the hardware shall be turned over to the owner at the completion of the job.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Screws and Fasteners:
 - 1. All closers and exit devices provided for exterior doors, hollow metal doors, and all other required shall be provided with thru-bolts.
 - 2. All finish hardware shall be installed to manufacturer's recommendations, using screws, attachments and installation tools provided with the hardware. No other screws or attachments are acceptable.

3. All other products to meet door and frame conditions.

B. Hinges:

1. Template: Provide templated units only.
2. Exterior: All exterior hinges shall be stainless steel base with stainless steel pin and stainless-steel finish.
3. Interior: All interior hinges steel based.
4. Interior corrosive: All interior hinges at corrosive areas shall be stainless steel base with stainless still pin and stainless-steel finish.
5. All hinges on doors over 36" wide, with exit devices, or with push/pull shall be heavy weight.
6. Electric Hinge: Provide minimum 8-wire.
7. Provide non-removable pins for out-swinging doors that are locked or are lockable.
8. All hinges on doors with door closers shall be ball bearing.
9. All hinges shall be full mortise.
10. Size: Provide 4 ½ x 4 ½ hinges on doors up to 3'0" in width. Provide 5 x 4 ½ hinges over 3'0" to 4'0" in width. Reference manufacturers catalog for all other sizes.
11. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.
12. Adjust hinge width as required for door, frame, trim and wall conditions to allow proper degree of opening.
13. Provide hinges conforming to ANSI/BHMA A156.1.
14. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.
15. Supply from the following list of manufacturers:

| | |
|--------|-----|
| Ives | IVE |
| Hager | HAG |
| Bommer | BOM |

C. Continuous Hinges

1. Continuous hinges to be manufactured of 6063-T6 aluminum.
2. Continuous hinge shall be certified to ANSI 156.26, Grade 1
3. Continuous hinge should be tested an approved UL10C.
4. Electrified – Provide minimum 8-wire with removable panel.
5. Provide hinges 1 inch shorter in length than nominal height of door, unless otherwise noted.
6. Provide reinforcing for doors weighing over 450 pounds and up to 600 pounds.
7. Supply from the following list of manufacturers:

| | |
|--------|-----|
| Ives | IVE |
| Select | SEL |
| ABH | ABH |

D. Mortise Locks

1. All locks on this project should be manufactured by the same manufacturer.
2. Mortise locksets shall meet ANSI/BHMA A156.13, Series 1000, Grade 1 Operational with all standard trims and conventional mortise cylinders.
3. All mortise locks shall be UL Listed for 3-hour fire door. Review lock for any height restriction.
4. Provide locks with a standard 2-3/4" (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latch bolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
5. Provide standard ASA strikes unless extended lip strike is necessary for frame/trim or 7/8" lip strike is necessary at pair with overlapping astragal.
6. Provide dust box.
7. Supply from the following list of manufacturers:

| | |
|---------|-----|
| Schlage | SCH |
| Falcon | FAL |
| Best | BES |

E. Exit Devices

1. All exit device types on this project should be manufactured by the same manufacturer.
2. Exit devices are to be architectural grade touch bar type. Touchpad to extend one half of door width.
3. Mechanism case to be smooth.
4. Exit devices shall meet ANSI A156.3, Grade 1.
5. All exit devices are UL listed Panic Exit or Fire Exit Hardware.
6. All lever trim to match lock trim in design and finish.
7. Dogging: Non-rated devices are to be provided with dogging. Less dogging where shown in Hardware Sets (some exterior, electrical rooms, electrified) Cylinder dogging as shown in hardware sets.
8. Exit devices are to be supplied and installed with thru-bolts for exterior, hollow metal doors, or as required for application.
9. Provide proper power supply for exit devices as required. Coordinate with Fire Alarm, Electrical and Security Contractor.
10. Push pads shall be metal, no plastic inserts allowed.
11. Exit devices shall have a flush end cap.
12. Exit devices shall be ordered with the correct strike for application.
13. Exit devices shall be order in the proper length to meet door width.
14. Exit devices shall have dead-latching.
15. Exit device shall be provided in width/height required based on door size.
16. Install exit devices with fasteners supplied by exit device manufacturer.
17. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits as required.
18. Provide proper concealed vertical rods for wood or hollow metal doors as required.
19. Factory or field drill weep holes for exit devices used in full exterior applications, highly corrosive areas, and where noted in the hardware sets.

20. Supply from the following list of manufacturers:

| | | |
|------------|-----|------------------|
| Von Duprin | VON | 35/98 Series |
| Falcon | FAL | 24/25 Series |
| Precision | PRE | 2100/2400 Series |
- F. Flush Bolts
 1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.
 2. Supply from the following list of manufacturers:

| | |
|----------|-----|
| Ives | IVE |
| Trimco | TRI |
| Rockwood | ROC |
- G. Coordinators
 1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
 2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices and hardware as required.
 3. Supply from the following list of manufacturers:

| | |
|----------|-----|
| Ives | IVE |
| Trimco | TRI |
| Rockwood | ROC |
- H. Pull Plates/Pulls/Push Plate
 1. Pull and Push Plates to meet ANSI 156.6 for .050" thickness.
 2. Pull and Push Plate size to 4" x 16".
 3. Pull Plate to have 10" center and 1" round on pull plate with concealed fasteners.
 4. Provide straight and offset pulls with fasteners as required
 5. Provide concealed fasteners for all applications.
 6. Prep plate for cylinder/lock as required.
 7. Supply from the following list of manufacturers

| | |
|----------|-----|
| Ives | IVE |
| Trimco | TRI |
| Rockwood | ROC |
- I. Door Closers
 1. All door closers on this project should be manufactured by the same manufacturer.

2. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
3. Door closers shall be furnished with standard cover. Provide full cover as shown in hardware sets.
4. Size in accordance with the manufacturers recommendations for door size and condition.
5. Door closers shall be furnished with delayed action, hold-open as listed in the Hardware Sets.
6. Door closers shall be mounted out of the line of sight wherever possible (i.e., room side of corridor doors, etc.) with parallel arm mounting on out swinging doors.
7. All closer installation shall include thru bolts on exterior, hollow metal doors or where required for application.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
9. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
10. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
11. Supply from the following list of manufacturers
LCN LCN
Falcon FAL
Norton NOR

J. Door Protection Plates

1. Protective plates shall meet ANSI A156.6 requirements for .050 thickness.
2. Protection plates should be fabricated from stainless steel.
3. Protection plate shall be height as shown in Hardware Sets. Width shall be 10" by 2" less than door width on single door or pair with a Mullion and 1" less than door width on pair of doors without a mullion.
4. Beveled 4 edges.
5. Provide kickplate on all doors with closers, unless not required for aesthetic reasons.
6. Prep protective plates for hardware as required.
7. Supply from the following list of manufacturers:
Ives IVE
Rockwood ROC
Trimco TRI

K. Door Stops and Holders:

1. Supply wall stops at all openings to protect doors or door hardware. Install so lock does not lock unintentionally. Install blocking in wall where wall stop will be mounted.

2. When wall conditions do not permit use of wall stop provide floor stops with risers as needed to adjust for floor conditions.
3. When wall conditions do not permit use of wall stop provide overhead stops. Jamb mount where required to not be visible from Corridor.
4. Exterior Ground Level Doors: Provide security floor stop.
5. Exterior Roof Doors: Provide heavy duty overhead stop.
6. Supply from the following list of manufacturers:
Glynn Johnson GLY
Rockwood ROC
Trimco TRI

L. Silencers

1. Provide silencers on all doors without seal. 3 for single doors and 2 for pairs.
2. Provide silencers as required for frame conditions. SR64 for hollow metal frames. SR65/SR66 for wood frames.
3. At wood frames, insure height of stop is compatible with silencer.
4. Supply from the following list of manufacturers:
Ives IVE
Rockwood ROC
Trimco TRI

M. Thresholds/Weather Stripping

1. Thresholds on doors in the accessible path shall conform to accessibility codes.
2. Threshold should be based on sill detail.
3. Smoke seal shall be teardrop design bulb seal.
4. Exterior seal/thresholds shall be silicone or brush as shown in hardware sets.
5. Drip strips shall protrude 2 ½" and be 4" wider than opening.
6. At S Label single doors provide seals on frame to comply with UL1784
7. At S Label pair of doors provide seals on frame and as meeting stile to comply with UL1784.
8. Automatic Door Bottom shall be mortised to comply with accessibility codes.
9. Supply from the following list of manufacturers:
Zero ZER
National Guard NGP
Pemko PEM

2.03 KEYING:

- A. General: Finish Hardware Supplier shall meet in person with owner to finalize keying requirements prior to the locks and exit devices being ordered and match existing or start a new Master Key System for the project. During keying meeting all hardware functions should be reviewed with the owner to finalize lock and exit device functions. During keying meeting determine all expansion required.
- B. Cylinders: Provide the correct and quantity of cylinders for all applications.

- C. Keys: Provide nickel silver keys only. Furnish 2 change keys for each lock: 5 control keys: 5 master keys for each master system and 5 grandmaster keys for each grandmaster key system. Deliver all keys to Owners' Representative.
- D. Cores and keys shall be provided with identification stamping.
- E. Provide construction keying / construction cores for this project with constructions keys.
- F. Provide Bitting List to Owner.

2.04 KEY CONTROL:

- A. Key Management: Key control shall be provided, by supplying a complete two tag key storage and management system. Each key shall be fully cut, indexed, tagged and installed on cabinet hooks by the lock supplier and shipped with the locks. Key cabinet provided shall be wall-mounted type with total number of locks supplied on the project plus 100% expansion capability.

2.05 QUALITY ASSURANCES:

- A. Texas Department of Insurance Windstorm Requirements: This project falls under the Texas Department of Insurance Windstorm Inspection Program for Inland II. All products, materials and installation systems shall be evaluated and approved by the Texas Department of Insurance, Windstorm Inspection Program, and listed in the TDI Product Evaluation Index or approved by the Windstorm Engineer as outlined below. Products, materials and installation systems not presently approved by the Texas Department of Insurance, Windstorm Inspection Program, may be considered for this project however, they must be properly submitted through the Architect for review by the Windstorm Engineer. This submittal shall be a part of the initial submittal process outlined in Section 01340 and the requirements for this portion are detailed within the Texas Department of Insurance, Windstorm Inspection website at the following location: www.tdi.state.tx.us/wind/submittal_requi.html. Products, materials and installation systems not approved by the Windstorm Engineer shall NOT be installed or utilized on this project.

PART 3 – EXECUTION:

3.01 EXAMINATION:

- A. Examine doors, frames and related items for conditions that would prevent the proper application of any finish hardware items. Do not proceed with installation until all defects are corrected.
- B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION:

- A. Follow Door and Hardware Institute Publication:
 - 1. Recommended Location for Architectural Hardware for Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Recommended Location for Builder's Hardware for Custom Steel Doors and Frames: HMMA 831.
 - 3. Recommended Locations for Architectural Hardware for Wood Flush Doors: DHI WDHS.3.
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Follow ANSI A117.1-1998 Accessible and Usable Building and Facilities and Texas Accessibility Standards.
- D. Review mounting locations with Architect where required.
- E. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers should not be visible in corridors, lobbies and other public spaces where possible.
- F. Locate power supplies in accessible location and indicate in as-builts where located.
- G. Set threshold in full bed of sealant complying with requirements specified in Division 07.
- H. Pre-Installation meeting required with attendees to include Architect, General Contractor, Mechanical Hardware Installer, Electrified Hardware Installer, Finish Hardware Supplier and Manufacturer's Representative for Exit Device, Locks and Closers and Door/Frame Suppliers before installation begins.

3.03 FIELD QUALITY CONTROL:

- A. After installation has been completed, obtain the services of an Architectural Hardware Consultant to check for proper installation of finish hardware, according to the finish hardware schedule and keying schedule. In addition, check all hardware for adjustments and proper operation.

3.04 ADJUST AND CLEAN:

- A. Adjust, clean and inspect all hardware, to ensure proper operation and function of every opening. Replace items, which cannot be adjusted to operate freely and smoothly as intended for the application made.

3.05 PROTECTION:

- A. The General Contractor shall use all means at his disposal to protect all finish hardware items from abuse, corrosion and other damage until the owner accepts the project as complete.

3.06 TRAINING

- A. After installation has been completed, provide training to the Owner on the operation of the Finish Hardware and programming of any electrified hardware.

3.07 HARDWARE SCHEDULE

- A. These hardware set shown below are for use as a guideline. Provide hardware as required to meet the requirements of the openings, security, and code requirements.

3.08 HARDWARE SETS

SPEXTRA: 440378

HARDWARE GROUP NO. 001 – OH DOOR
FOR USE ON MARK/DOOR #(S):

115.2

EACH TO HAVE:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|------------------------------|---|--------|-----|
| 1 | EA | SFIC EVEREST CORE | 80-037 | 626 | SCH |
| 1 | EA | CYLINDER BALANCE HARDWARE | SFIC AS REQUIRED PROVIDED BY THE OH DOOR MFG | 626 | SCH |

COORDINATE HARDWARE WITH DOOR MFR.

HARDWARE GROUP NO. 002

FOR USE ON MARK/DOOR #(S):

101.1 102.1 103.1

EACH TO HAVE:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------|-----------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | OFFICE/ENTRY LOCK | LV9050HD 06A L583-363 | 630 | SCH |
| 1 | EA | SFIC EVEREST CORE | 80-037 | 626 | SCH |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |

| | | | | | |
|---|----|----------|------|-----|-----|
| 3 | EA | SILENCER | SR64 | GRY | IVE |
|---|----|----------|------|-----|-----|

HARDWARE GROUP NO. 003

FOR USE ON MARK/DOOR #(S):
108.1

EACH TO HAVE:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | STOREROOM LOCK | LV9080HD 06A | 630 | SCH |
| 1 | EA | SFIC EVEREST CORE | 80-037 | 626 | SCH |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HARDWARE GROUP NO. 004

FOR USE ON MARK/DOOR #(S):
109.1 110.1

EACH TO HAVE:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|------------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | PRIVACY LOCK | LV9040 06A L583-363 L283-722 | 630 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP RW/PA SRI | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HARDWARE GROUP NO. 005 – ACCESS CONTROLLED

FOR USE ON MARK/DOOR #(S):
114.1 106.1

EACH TO HAVE:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|---------------|---------------------------------------|--------|-----|
| 2 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | HINGE | 5BB1 4.5 X 4.5 TW8 | 652 | IVE |
| 1 | EA | ELECTRIC LOCK | L9092HDEU 06A RX TORX SCREWS+XL11-848 | 630 | SCH |

CONSTRUCTION DOCUMENTS
SPECIFICATIONS
50% MIDPOINT

CAMINO REAL WORK FORCE CTR
RENOVATION & EXPANSION PROJ.

FINISH HARDWARE
087100
01/08/2021

| | | | | | |
|---|----|-------------------|----------------------------------|-----|-----|
| 1 | EA | SFIC EVEREST CORE | 80-037 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP RW/PA SRI | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |
| 1 | EA | DOOR SCOPE | DS2000-2 1/8" (DOOR E109.2 ONLY) | GRY | IVE |
| | | CARD READER | PROVIDED BY OTHER | | |
| | | POWER SOURCE | PROVIDED BY OTHER | | |

INGRESS BY THE CARD READER OR KEY OVERRIDE.

EGRESS BY THE LEVER.

SEE HARDWARE SET #X100 FOR ADDITIONAL INFORMATION

HARDWARE GROUP NO. 006– ACCESS CONTROLLED

FOR USE ON MARK/DOOR #(S):

100.1 115.1

EACH TO HAVE:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|------------------------------|------------------------------------|--------|-----|
| 2 | EA | CONTINUOUS HINGE | 112XY-DOOR HEIGHT | 628 | IVE |
| 1 | EA | FIRE RATED REMOVABLE MULLION | KR9954B STAB X MT54 X 154 | 689 | VON |
| 1 | EA | PANIC HARDWARE | HH-98-L-RHR | 630 | VON |
| 1 | EA | PANIC HARDWARE | HH-98-L-LHR | 630 | VON |
| 2 | EA | SFIC EVEREST CORE | 80-037 | 626 | SCH |
| 1 | EA | SFIC MORTISE CYL. | 80-132 W/KEYED CONST. CORE | 626 | SCH |
| 1 | EA | SFIC RIM CYLINDER | 80-159 W/KEYED CONST. CORE | 626 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP SCUSH SRI 4040-18PA 4040-30 | 689 | LCN |
| 1 | EA | MULLION SEAL | 8780N-MULLION HEIGHT | BK | ZER |
| 1 | EA | RAIN DRIP | 142AA-FRAME WIDTH + 4" | AA | ZER |
| 1 | EA | DOOR SWEEP | 39A-DOOR WIDTH | | STE |
| 1 | EA | THRESHOLD | 566A-FRAME WIDTH | A | ZER |
| | | SEALS | PROVIDED BY DOOR MFG | | |

INGRESS BY THE CARD READER OR KEY OVERRIDE.

EGRESS BY THE PANIC HARDWARE.

VERIFY WINDSTORM "CERTIFICATION" OF SPECIFIED HARDWARE WITH DOOR SYSTEM (BASED ON STEELCRAFT SYSTEM).

INGRESS BY THE CARD READER OR KEY OVERRIDE.

EGRESS BY THE LEVER.

SEE HARDWARE SET #X100 FOR ADDITIONAL INFORMATION

HARDWARE GROUP NO. 007 – ACCESS CONTROLLED

FINISH HARDWARE

087100 - 14/16

FOR USE ON MARK/DOOR #(S):

107.1 104.1

EACH TO HAVE:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----|-------------------|---|--------|-----|
| 2 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 652 | IVE |
| 1 | EA | ELECTRIC HINGE | 5BB1 4.5 X 4.5 TW8 | 652 | IVE |
| 1 | EA | EU MORTISE LOCK | L9092HDEU 06A RX LX (FAIL SECURE) TORX SCREWS+XL11-848 | 630 | SCH |
| 1 | EA | SFIC EVEREST CORE | 80-037 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP RW/PA SRI TBSRT | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |
| 1 | EA | FLOOR STOP | FS410 (DOOR C106.1 ONLY) | 626 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |
| 1 | EA | DIAL LOCK | X-10 (DOOR C104.1 ONLY) | | M-H |
| 1 | SET | SMOKE SEAL | 8145S-BK-PSA-HEAD & JAMBS (DOOR C104.1 ONLY) | GRY | IVE |

INGRESS BY THE CARD READER OR KEY OVERRIDE.

EGRESS BY THE LEVER.

SEE HARDWARE SET #X100 FOR ADDITIONAL INFORMATION

HARDWARE GROUP NO. 008

FOR USE ON MARK/DOOR #(S):

115.3

EACH TO HAVE:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----|---------------------|-----------------------------------|--------|-----|
| 1 | EA | CONTINUOUS HINGE | A110HD RC8-DOOR HEIGHT | 628 | ABH |
| 1 | EA | ELEC PANIC HARDWARE | RX-QEL-HH-9875-L-NL-06-SS7500-SNB | 630 | VON |
| 1 | EA | SFIC EVEREST CORE | 80-037 | 626 | SCH |
| 1 | EA | SFIC MORTISE CYL. | 80-132 W/KEYED CONST. CORE | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP SCUSH SRI | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | SET | SEALS | PS-074-HEAD & JAMBS | | STE |
| 1 | EA | RAIN DRIP | 142AA-FRAME HEADER + 4" | AA | ZER |
| 1 | EA | DOOR SWEEP | FAS-SEAL-DOOR WIDTH | | STE |
| 1 | EA | THRESHOLD | 566A-FRAME WIDTH | A | ZER |
| | | CARD READERS | PROVIDED BY OTHER | | |
| | | POWER SOURCE | PROVIDED BY OTHER | | |

VERIFY WINDSTORM "CERTIFICATION" OF SPECIFIED HARDWARE WITH DOOR SYSTEM (BASED ON STEELCRAFT SYSTEM).

INGRESS BY THE CARD READER OR KEY OVERRIDE.

EGRESS BY THE LEVER.

SEE HARDWARE SET #X100 FOR ADDITIONAL INFORMATION

END OF SECTION

SECTION 088000 – GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
 - 3. Storefront framing.
- B. Related Sections:
 - 1. Section 084113 "Aluminum Framed Entrances and Storefronts."
 - 2. Section 085113 "Aluminum Windows"

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.4 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. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

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

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 3. Test no fewer than 2 Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of the following products; 12 inches square.
 1. Tinted glass.
 2. Coated glass.
 3. Insulating glass.
- C. Glazing Accessory Samples: For gaskets and sealants, in 12-inch lengths.
- 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.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers and manufacturers of insulating-glass units with sputter-coated, low-e coatings.
- B. Product Certificates: For glass and glazing products, from manufacturer.

- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass glazing sealants and glazing gaskets.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain ultraclear float glass coated float glass and insulating glass from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- J. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which 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. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
 - 1. Obtain tinted glass from single source from single manufacturer.
 - 2. Obtain reflective-coated glass from single source from single manufacturer.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

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. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300.
 - 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 on Drawings.
 - b. Basic Wind Speed: As indicated on Drawings
 - c. Importance Factor: As indicated on Drawings
 - d. Exposure Category: As indicated on Drawings
 - 3. Design Snow Loads: As indicated on Drawings.
 - 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
 - 5. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
 - 6. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.

7. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 1. Minimum Glass Thickness for Exterior Lites: Not less than 1/4 inch.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- F. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes basic -protection testing requirements in ASTM E 1996 for Wind Zone 4 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.
 1. Large-Missile Test: For all glazing, regardless of height above grade.
- G. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- H. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

1. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: "Glazing Manual."
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- E. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
 1. Minimum Glass Thickness for Exterior Lites: 6 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- F. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 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.
 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.
 3. For coated vision glass, comply with requirements for Condition C (other coated glass).

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

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 INSULATING GLASS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Pilkington or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products.

1. AGC Glass North America
2. Vitro Architectural Glass

- B. 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.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
2. Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

- C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.6 GLAZING GASKETS

- A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.7 GLAZING SEALANTS

- A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall have a VOC content of 250 g/L or less.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

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

- a. **Dow Corning Corporation; 790.**
- b. **GE Advanced Materials - Silicones; SilPruf LM SCS2700.**
- c. **May National Associates, Inc.; Bondaflex Sil 290.**
- d. **Pecora Corporation; 890.**
- e. **Sika Corporation, Construction Products Division; SikaSil-C990.**
- f. **Tremco Incorporated; Spectrem 1.**

2. Applications: 1 inch low-e insulated glass.

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.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit 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 publications, to comply with system performance requirements.

- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.10 INSULATING-GLASS TYPES

- A. Glass Type : Low-E-coated, tinted insulating glass.
 - 1. Basis-of-Design Product: Pilkington.
 - 2. Overall Unit Thickness: 1 inch.
 - 3. Minimum Thickness of Each Glass Lite: ¼".
 - 4. Outdoor Lite: Tinted fully tempered float glass.
 - 5. Tint Color: OptiFloat Grey
 - 6. Interspace Content: Argon.
 - 7. Indoor Lite: Clear heat-strengthened float glass.
 - 8. Low-E Coating: Pyrolytic on second surface.
 - 9. Summer Daytime U-Factor: 0.64 maximum.
 - 10. Visible Light Transmittance: 60 percent minimum.
 - 11. Solar Heat Gain Coefficient: 0.70 maximum.
 - 12. Safety glazing required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, 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 systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 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. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- 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.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

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

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

- E. 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 in writing by glass manufacturer.

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section includes the following types of silvered flat glass mirrors:
 - 1. Annealed monolithic glass mirrors.
 - 2. Film-backed glass mirrors qualifying as safety glazing.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 088000 "Glazing" for glass with reflective coatings used for vision and spandrel lites.
 - 3. Section 102800 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
 - 2. Mirror Clips: Full size.
 - 3. Mirror Trim: 12 inches long.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of mirror.
- C. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.
- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.

1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.9 FIELD CONDITIONS

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

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Avalon Glass and Mirror Company.
 2. Independent Mirror Industries, Inc.
 3. National Glass Industries.
- B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C1503; manufactured using copper-free, low-lead mirror coating process.
- B. Annealed Monolithic Glass Mirrors: Mirror Quality, clear.
 - 1. Nominal Thickness: 3.0 mm.
- C. Safety Glazing Products: For film-backed mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 - 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. Franklin International.
 - b. OSI Sealants; Henkel Corporation.
 - c. Pecora Corporation.
 - d. Sommer & Maca Industries, Inc.
 - 2. Adhesives shall have a VOC content of 70 g/L or less.
- D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.4 MIRROR HARDWARE

- A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
 3. Finish: Clear bright anodized.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- C. 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.

2.5 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Flat polished.
1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.
- D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
 - 1. GANA Publications: "Laminated Glazing Reference Manual," "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors with mastic and mirror hardware. 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 mirrors.
 - 1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
 - 2. Mirror Clips: Place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges. Locate clips so they are symmetrically placed and evenly spaced.
 - 3. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.
 - 3. Grid suspension systems for gypsum board ceilings.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Horizontal Deflection: For wall assemblies, limited to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C 645. Use either steel studs and tracks or embossed steel studs and tracks.
 - 1. Steel Studs and Tracks:

2. **Basis-of-Design Product:** Subject to compliance with requirements, provide ClarkDietrich Building Systems Cold Formed Metal Framing or comparable product by one of the following:
 - a. MBA Metal Framing
 - b. Marino\Ware
 - c. Minimum Base-Metal Thickness: As indicated on Drawings.
 - d. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 1. **Basis-of-Design Product:** Subject to compliance with requirements, provide ClarkDietrich Building Systems Cold Formed Metal Framing or comparable product by one of the following:
 - a. MBA Metal Framing
 - b. Marino\Ware
 2. Where possible provide all of the following from the same source.
 3. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch minimum vertical movement.
 4. Single Long-Leg Track System: ASTM C 645 top track with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 5. Double-Track System: ASTM C 645 top outer tracks, inside track with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
 6. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: 0.0179 inch.
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
 1. Depth: 1-1/2 inches.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- C. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
 - 1. Depth: 2-1/2 inches.
- D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. [USG Corporation](#)
 - 2. [Armstrong World industries](#)

2.4 AUXILIARY MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling 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 non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

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

- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install 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.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

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

- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to steel roof deck.
 - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
 - 3. Texture finishes.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
 - 3. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

4. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 3. Simulate finished lighting conditions for review of mockups.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

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

PART 2 - PRODUCTS

2.1 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 GYPSUM BOARD, GENERAL

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

2.3 INTERIOR GYPSUM BOARD

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation Products or comparable product by one of the following:
- 2. Manufacturers including
 - a. American Gypsum.
 - b. CertainTeed Corp.
 - c. Georgia-Pacific Gypsum LLC.
 - d. National Gypsum Company.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
1. **Products:** Subject to compliance with requirements, provide the following at all wet wall areas to include, but not limited to, Toilets, Showers, Lockers, and Decontamination Rooms:
 - a. USG Corporation; DUROCK Cement Board.
 2. Thickness: 5/8 inch.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - b. 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.
- B. Exterior Trim: ASTM C 1047.
1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
1. Interior Gypsum Board: Paper.

2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
1. Adhesives shall have a VOC content of 50 g/L or less.
 2. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 3. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, provide one of the following :

- a. [Accumetric LLC; BOSS 824 Acoustical Sound Sealant.](#)
 - b. [Grabber Construction Products; Acoustical Sealant GSC.](#)
 - c. [Pecora Corporation; AC-20 FTR .](#)
 - d. [Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.](#)
 - e. [USG Corporation; SHEETROCK Acoustical Sealant.](#)
2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- F. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."

2.8 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
- B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.
1. [Products](#): Subject to compliance with requirements, provide one of the following :
 - a. [CertainTeed Corp.; ProRoc Easi-Tex Spray Texture.](#)
 - b. [National Gypsum Company; Perfect Spray EM Texture.](#)
 - c. [USG Corporation; BEADEx FasTex Wall and Ceiling Spray Texture.](#)
 2. Texture: light Orange Peel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations: Coordinate locations with partition schedule on drawings. Where list below conflicts with drawings contact architect for confirmation.
1. Wallboard Type: Vertical surfaces unless otherwise indicated.
 2. Mold / Moisture Resistant: Coordinate locations with partition schedule on drawings.
 - a. Wet areas
 - b. Toilets
 - c. Kitchens / Breakrooms
 - d. Utility / Janitor's Closets
 - e. Mechanical / Fire / Electrical
 3. Abuse-Resistant: Coordinate locations with partition schedule on drawings.
 - a. Corridors / Hallways
 - b. Stairways
 4. Impact-Resistant: Coordinate locations with partition schedule on drawings.
 - a. Storage
 - b. Corridors / Hallways
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- B. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

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

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
- D. Exterior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09911 "Interior and Exterior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 APPLYING TEXTURE FINISHES

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

- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Porcelain tile.
 - 2. Tile backing panels.
 - 3. Waterproof membrane for thinset applications.
 - 4. Crack isolation membrane.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 3. Section 092900 "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. **Product Data:** For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. **Laboratory Test Reports:** For sealers, indicating compliance with requirements for low-emitting materials.
- 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 for Initial Selection: For tile, grout, and accessories involving color selection.
- E. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 36 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product.
- D. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of wall tile installation.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 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 requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

- D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Waterproof membrane.
 - 2. Cementitious backer units.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 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 TCNA 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.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

- A. Ceramic Tile Type (Designations as noted on Drawings): porcelain tile
- B. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
 - 1. Face Size: As noted on drawings.
 - 2. Grout Color: As indicated on drawings.
 - 3. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Wainscot Cap: Surface bullnose, module size same as adjoining flat tile.
 - b. External Corners: Surface bullnose, module size same as adjoining flat tile.
 - c. Internal Corners: Field-butt square corners.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
 - 1. Cementitious Backer Units shall be by same manufacturer as Gypsum Board Assembly units.
 - 2. Thickness: 5/8 inch.

2.5 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. Manufacturer and color shall be as noted on drawings.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.

4. 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. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

2.7 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. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
 - 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. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
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. **Bonsal American, an Oldcastle company.**
 - b. **Custom Building Products.**
 - c. **Southern Grouts & Mortars, Inc.**

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 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 the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA 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 TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. 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.

- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- 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. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Glazed Wall Tile: 1/8 inch.
 - 2. Porcelain Tile: 1/4 inch.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. 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.

3.4 TILE BACKING PANEL INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.
 - 1. Adhesives shall have a VOC content of 65 g/L or less.

3.7 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.8 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.9 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations shall be as noted on interior elevations and schedule.

END OF SECTION 093013

CONSTRUCTION DOCUMENTS
SPECIFICATIONS
ISSUED FOR CONSTRUCTION

CAMINO REAL WORK FORCE CTR
RENOVATION & EXPANSION PROJ.

CERAMIC TILING
093013

SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Acoustical tiles for ceilings.
 - 2. Wet Area Acoustical tiles for ceilings.
 - 3. Concealed suspension systems.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6-inches-in size.
- C. Samples for Initial Selection: For components with factory-applied color finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Tile: Set of full-size Samples of each type, color, pattern, and texture.
 - 2. Concealed Suspension-System Members: 6-inch-long Sample of each type.
 - 3. Exposed Moldings and Trim: Set of 6-inch-long Samples of each type and color.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension-system members.
 - 2. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 3. Minimum Drawing Scale: 1/8 inch = 1 foot.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical tile ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

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

1.7 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.
 - 1. Acoustical Ceiling Units: Full-size tiles equal to 2 percent of quantity installed.

2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to the National Voluntary Laboratory Accreditation Program (NVLAP) for testing indicated.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockup of typical ceiling area as shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

- B. 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: Comply with ASTM E 1264 for Class B materials.
 - 2. Smoke-Developed Index: 25 or less.
- C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL TILES, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Tile: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system from single source from single manufacturer.
- C. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.
- D. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL TILES

- A. Acoustical Tiles for wet areas shall be water, moisture and sag resistant.
- B. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product

named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

1. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

- C. **Basis-of-Design Product:** Subject to compliance with requirements, provide Products as noted in drawings or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products:

1. [Armstrong World Industries, Inc.](#)
2. [CertainTeed Corp.](#)
3. [USG Interiors, Inc.; Subsidiary of USG Corporation.](#)

- D. Classification: Provide tiles complying with ASTM E 1264 for type, form, and pattern as indicated on drawings:

- E. Color: As noted on drawings.

- F. NRC: Not less than 0.70.

- G. Edge/Joint Detail: Square, kerfed and rabbeted; tongue and grooved; or butt.

- H. Thickness: 5/8 inch.

- I. Modular Size: As indicated on Drawings.

- J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Suspension systems for wet areas shall be rust, water, moisture and sag resistant.

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

- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

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

2.5 METAL SUSPENSION SYSTEM

- A. Manufacturers: Provide products from same manufacturer as tiles.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Provide products from same manufacturer as tiles.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Provide manufacturer's standard edge moldings that fit acoustical tile edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 - 2. Acoustical Sealant for Concealed Joints:
 - a. Henkel Corporation; OSI Sealants Pro-Series SC-175 Rubber Base Sound Sealant.
 - b. Pecora Corporation; AIS-919.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
 - 2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.

2.8 MISCELLANEOUS MATERIALS

- A. Acoustical Tile Adhesive: Type recommended in writing by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
 2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches o.c.
 3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Compliance of seismic design.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- C. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.
 - 1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - 2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Acoustical tile ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095123

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoset-rubber base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Samples for Initial Selection: For each type of product indicated.

- D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - 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 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.

- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE: Designation as noted on Drawings.

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Products as noted in drawings or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products:
 - 1. Mannington Commercial
 - 2. Roppe
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with bare concrete and resilient floor coverings.
- C. Thickness: 0.125 inch.
- D. Height: As indicated on Drawings.
- E. Lengths: Cut lengths 48 inches long.
- F. Outside Corners: Preformed.
- G. Inside Corners: Preformed.
- H. Colors: As indicated on Drawings.

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 resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less and 60 g/L or less for rubber stair treads.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

CONSTRUCTION DOCUMENTS
SPECIFICATIONS
ISSUED FOR CONSTRUCTION

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- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior items and surfaces.
 - 1. 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 these specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Section includes surface preparation and the application of paint systems on exterior substrates.

1. Concrete.
2. Fiber-cement board.
3. Clay masonry.
4. Concrete masonry units (CMUs).
5. Steel and iron.
6. Galvanized metal.
7. Aluminum (not anodized or otherwise coated).
8. Copper.
9. Stainless steel.
10. Wood.
11. Fiberglass.
12. Plastic.
13. Portland cement plaster (stucco).
14. Gypsum board.
15. Cotton or canvas insulation covering.
16. Bituminous-coated surfaces.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:
 - a. Flush wood doors.
 - b. Acoustical wall panels
 - c. Metal toilet enclosures
 - d. Metal lockers
 - e. Elevator equipment
 - f. Finished mechanical and electrical equipment
 - g. Light fixtures.
2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas
 - b. Ceiling plenums
 - c. Pipe spaces
3. Finished metal surfaces include the following:
 - a. Anodized aluminum
 - b. Stainless steel
 - c. Chromium plate
 - d. Copper and copper alloys
 - e. Bronze and brass
4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators
 - b. Linkages
 - c. Sensing devices
 - d. Motor and fan shafts

E. Related Requirements:

1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
2. Section 051200 "Structural Steel Framing" for shop priming of metal substrates.
3. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
4. Section 055213 "Pipe and Tube Railings" for shop painting pipe and tube railings.

1.3 DEFINITIONS

- A. MPI Gloss Level 1 - **Flat**: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 3 – **Eggshell-like**: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 4 – **Satin-like**: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 5 – **Semi-gloss**: 35 to 70 units at 60 degrees, according to ASTM D523.
- E. MPI Gloss Level 6 - **Gloss**: 70 to 85 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 7 – **High gloss**: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 2. Indicate VOC content.
 3. **Include block fillers and primers.**
- B. Sustainable Design Submittals:
 1. **Product Data**: For paints and coatings, indicating VOC content.
 2. Environmental Product Declaration (EPD): For each product.
 3. Health Product Declaration (HPD): For each product.
 4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
 5. Manufacturer Inventory: For each product, provide manufacturer's manifest of ingredients.

- C. Samples for Initial Selection: For each type of topcoat product.
- D. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - a. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. **Applicator Qualifications:** A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this project, whose work has resulted in applications with a record or successful in-service performance.
- B. **Source Limitations:** Obtain block fillers and primers 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.
 - 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.

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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 1. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior Painting Schedule for the paint category indicated.
- C. Manufacturer's Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Benjamin Moore & Co. (Benjamin Moore)
2. ICI Dulux Paint Centers (ICI Dulux Paints)
3. PPG Industries, Inc. (Pittsburgh Paints)
4. Sherwin-Williams Co. (Sherwin-Williams)

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
1. Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 2. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 3. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. 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.
- D. Chemical Components of interior paints and coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
1. Interior MPI Gloss Level 1 - Flat paints and coatings: VOC content of not more than 50 g/L.
 2. Interior Non-Flat paints and coatings: VOC content of not more than 150g/L.
 3. Exterior MPI Gloss Level 1 – Flat paints and coatings: VOC content of not more than 100 g/L.
 4. Exterior Non-Flat paints and coatings: VOC content of not more than 200 g/L.
 5. Anticorrosive Coatings: VOC content of not more than 250 g/L.
 6. Varnishes and Sanding sealers: VOC content of not more than 350 g/L.
 7. Stains: VOC content of not more than 250 g/L.
 8. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings in the molecular structure).

9. **Restricted Components:** Paints and coatings shall not contain any of the following:

- a. Acrolein
- b. Acrylonitrile
- c. Antimony
- d. Benzene
- e. Butyl benzyl phthalate
- f. Cadmium
- g. Di (2-ethylhexyl) phthalate
- h. Di-n-butyl phthalate
- i. Di-n-octyl phthalate
- j. 1,2-dichlorobenzene
- k. Diethyl phthalate
- l. Dimethyl phthalate
- m. Ethylbenzene
- n. Formaldehyde
- o. Hexavalent chromium
- p. Isophorone
- q. Lead
- r. Mercury
- s. Methyl ethyl ketone
- t. Methyl isobutyl ketone
- u. Methylene chloride
- v. Naphthalene
- w. Toluene (methylbenzene)
- x. 1,1,1-trichloroethane
- y. Vinyl chloride

E. **VOC Content:** For field applications, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoaters: 100 g/L.
5. Rust-Preventive Coatings: 100 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Shellacs, Clear: 730 g/L.
9. Shellacs, Pigmented: 550 g/L.

F. **Colors:** As indicated in a color schedule. Color designations (PT-1, PT-2, etc.) are from Sherwin Williams. Matching colors of other manufacturers are acceptable.

2.3 SOURCE QUALITY CONTROL

A. **Testing of Paint Materials:** Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Fiber-Cement Board: 12 percent.
 3. Masonry (Clay and CMUs): 12 percent.
 4. Wood: 15 percent.
 5. Portland Cement Plaster: 12 percent.
 6. Gypsum Board: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 2.
 - 2. SSPC-SP 3.
 - 3. SSPC-SP 7/NACE No. 4.
 - 4. SSPC-SP 11.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

- K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of window frames and sashes.
 - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 - 1. Latex System MPI EXT 3.1A:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Prime Coat: Latex, exterior, matching topcoat.
 - c. Intermediate Coat: Latex, exterior, matching topcoat.
 - d. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 - 2. Water-Based Light Industrial Coating System MPI EXT 3.1C:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

- c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.

B. Concrete Substrates, Traffic Surfaces:

1. Latex Floor Paint System MPI EXT 3.2A:

- a. Prime Coat: Floor paint, latex, matching topcoat.
- b. Intermediate Coat: Floor paint, latex, matching topcoat.
- c. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3), MPI #60.

2. Latex Deck Coating System MPI EXT 3.2B:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Deck coating, latex, MPI #127.

3. Alkyd Floor Enamel System MPI EXT 3.2D:

- a. Prime Coat: Floor enamel, matching topcoat.
- b. Intermediate Coat: Floor enamel, matching topcoat.
- c. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6), MPI #27.
- d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.

4. Clear Water-Based Sealer System MPI EXT 3.2H:

- a. Prime Coat: Sealer, water based, matching topcoat.
- b. Intermediate Coat: Sealer, water based, matching topcoat.
- c. Topcoat: Sealer, water based, for concrete floors, MPI #99.

5. Clear Sealer System MPI EXT 3.2G:

- a. Prime Coat: Sealer, solvent based, matching topcoat.
- b. Intermediate Coat: Sealer, solvent based, matching topcoat.
- c. Topcoat: Sealer, solvent based, for concrete floors, MPI #104.

C. Cement Board Substrates:

1. Latex System MPI EXT 3.3A:

- a. Prime Coat: Latex, exterior, matching topcoat.
- b. Prime Coat: Primer, alkali resistant, water based, MPI #3.
- c. Intermediate Coat: Latex, exterior, matching topcoat.
- d. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.

2. Water-Based Light Industrial Coating System MPI EXT 3.3C:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
 3. Alkyd System MPI EXT 3.3B:
 - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
- D. Clay Masonry Substrates:
1. Latex System MPI EXT 4.1A:
 - a. Prime Coat: Latex, exterior, matching topcoat.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 2. High-Build Latex System MPI EXT 4.1H: Dry film thickness of not less than 10 mils.
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Latex, exterior, high build, MPI #40.
 3. Water-Based Light Industrial Coating System MPI EXT 4.1C:
 - a. Prime Coat: Light industrial coating, exterior, water based, matching topcoat.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
- E. CMU Substrates:
1. Latex System MPI EXT 4.2A:
 - a. Prime Coat: Block filler, latex, interior/exterior, MPI #4.

- 1) Benjamin Moore; Moore's IMC Latex Block Filler No. M88: Applied at a dry film thickness of not less than 0.206 mm.
 - 2) ICI Dulux Paints; Bloxfil 4000-1000 Interior/Exterior Heavy Duty Acrylic Block Filler: Applied at a dry film thickness of not less than 0.178 to 0.368 mm.
 - 3) Pittsburgh Paints; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 0.152 to 0.318 mm.
 - 4) Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 0.203 mm.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
- F. Steel and Iron Substrates:
1. Alkyd System MPI EXT 5.1D:
 - a. Prime Coat: Primer, alkyd, anticorrosive, for metal, MPI #79.
 - b. Prime Coat: Primer, metal, surface tolerant, MPI #23.
 - c. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
 2. Aluminum Paint System MPI EXT 5.1K:
 - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
 - b. Prime Coat: Shop primer specified in Section where substrate is specified.
 - c. Intermediate Coat: Aluminum paint, matching topcoat.
 - d. Topcoat: Aluminum paint, MPI #1.
- G. Galvanized-Metal Substrates:
1. Alkyd System MPI EXT 5.3B:
 - a. Prime Coat: Primer, galvanized, cementitious, MPI #26.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
 2. Aluminum Paint System MPI EXT 5.3F:
 - a. Prime Coat: Primer, galvanized, cementitious, MPI #26.

- b. Intermediate Coat: Aluminum paint, matching topcoat.
- c. Topcoat: Aluminum paint, MPI #1.

H. Aluminum Substrates:

1. Latex System MPI EXT 5.4H:

- a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.

2. Water-Based Light Industrial Coating System MPI EXT 5.4G:

- a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
- c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.

3. Alkyd System MPI EXT 5.4A:

- a. Pretreatment Prime Coat: Vinyl wash primer, MPI #80.
- b. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- c. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
- d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

I. Stainless-Steel Substrates:

1. Latex System MPI EXT 5.6F:

- a. Prime Coat: Primer, bonding, solvent based, MPI #69.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.

2. Water-Based Light Industrial Coating System MPI EXT 5.6G:

- a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

- c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
 - 3. Alkyd System MPI EXT 5.6A:
 - a. Prime Coat: Vinyl wash primer, MPI #80.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
- J. Wood Substrates: Wood trim Wood board siding and wood fences.
 - 1. Latex over Latex Primer System MPI EXT 6.3L:
 - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 - 2. Latex System MPI EXT 6.3A:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 - 3. Water-Based Light Industrial Coating System MPI EXT 6.3J:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
 - 4. Alkyd System MPI EXT 6.3B:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
- K. Wood Substrates: Wood-based panel products.
 - 1. Latex over Latex Primer System MPI EXT 6.4K:

- a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 2. Latex over Alkyd Primer System MPI EXT 6.4G:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 3. Alkyd System MPI EXT 6.4B:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
- L. Wood Substrates: Traffic surfaces, including lumber decking.
1. Latex Porch and Floor Paint over Latex Primer System MPI EXT 6.5E:
 - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Intermediate Coat: Latex floor paint, matching topcoat.
 - c. Topcoat: Latex floor paint, low gloss, MPI #60.
 - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
 2. Latex Porch and Floor Paint over Alkyd Primer System MPI EXT 6.5A:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Intermediate Coat: Latex floor paint, matching topcoat.
 - c. Topcoat: Latex floor paint, low gloss, MPI #60.
 - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
 3. Alkyd Floor Enamel System MPI EXT 6.5B:
 - a. Prime Coat: Floor enamel, alkyd, gloss, matching topcoat.
 - b. Intermediate Coat: Floor enamel, alkyd, gloss, matching topcoat.
 - c. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6), MPI #27.

- d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
- 4. Alkyd Floor Enamel over Wood Preservative System MPI EXT 6.5C:
 - a. Preservative Coat: Preservative, for exterior wood, MPI #37.
 - b. Prime Coat: Floor enamel, alkyd, gloss, matching topcoat.
 - c. Intermediate Coat: Floor enamel, alkyd, gloss, matching topcoat.
 - d. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6), MPI #27.
 - e. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
- M. Fiberglass Substrates:
 - 1. Latex System MPI EXT 6.7A:
 - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 - 2. Water-Based Light Industrial Coating System MPI EXT 6.7C:
 - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
 - 3. Alkyd System MPI EXT 6.7B:
 - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
- N. Plastic Trim Fabrication Substrates:
 - 1. Latex System MPI EXT 6.8A:
 - a. Prime Coat: Primer, bonding, water based, MPI #17.
 - b. Prime Coat: Primer, bonding, solvent based, MPI #69.

- c. Intermediate Coat: Latex, exterior, matching topcoat.
 - d. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 - 2. Water-Based Light Industrial Coating System MPI EXT 6.8C:
 - a. Prime Coat: Primer, bonding, water based, MPI #17.
 - b. Prime Coat: Primer, bonding, solvent based, MPI #69.
 - c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - d. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
 - 3. Alkyd System MPI EXT 6.8B:
 - a. Prime Coat: Primer, bonding, water based, MPI #17.
 - b. Prime Coat: Primer, bonding, solvent based, MPI #69.
 - c. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
- O. Portland Cement Plaster Substrates:
 - 1. Latex System MPI EXT 9.1A:
 - a. Prime Coat: Latex, exterior, matching topcoat.
 - b. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - c. Intermediate Coat: Latex, exterior, matching topcoat.
 - d. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 - 2. Water-Based Light Industrial Coating System MPI EXT 9.1B:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
- P. Exterior Gypsum Board Substrates:

1. Latex System MPI EXT 9.2A:
 - a. Prime Coat: Primer, latex for exterior wood (reduced), MPI #6.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
2. High-Build Latex System MPI EXT 9.2D: Dry film thickness of not less than 10 mils.
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Latex, exterior, high build, MPI #40.
3. Alkyd System MPI EXT 9.2B:
 - a. Prime Coat: Primer, latex for exterior wood (reduced), MPI #6.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.
 - 1. Concrete.
 - 2. Cement board.
 - 3. Clay masonry.
 - 4. Concrete masonry units (CMUs).
 - 5. Steel and iron.
 - 6. Galvanized metal.
 - 7. Aluminum (not anodized or otherwise coated).
 - 8. Copper.
 - 9. Stainless steel.
 - 10. Wood.
 - 11. Fiberglass.
 - 12. Plastic.
 - 13. Gypsum board.

14. Plaster.
15. Acoustic panels and tiles.
16. Spray-textured ceilings.
17. Cotton or canvas insulation covering.
18. ASJ insulation covering.
19. Bituminous-coated surfaces.

B. Related Requirements:

1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
2. Section 051200 "Structural Steel Framing" for shop priming structural steel.
3. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
4. Section 055113 "Metal Pan Stairs" for shop priming metal pan stairs.
5. Section 055213 "Pipe and Tube Railings" for shop priming and painting pipe and tube railings.

1.3 DEFINITIONS

- A. MPI Gloss Level 1 – **Flat or Matte**: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 2 – **Velvet-Like**: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 3 – **Eggshell-Like**: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 4 – **Satin-Like**: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. MPI Gloss Level 5 – **Semi-Gloss**: 35 to 70 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 6 – **Gloss**: 70 to 85 units at 60 degrees, according to ASTM D523.
- G. MPI Gloss Level 7 – **High Gloss**: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 2. Indicate VOC content.

- B. Sustainable Design Submittals:
 - 1. **Product Data:** For paints and coatings, indicating VOC content.
 - 2. **Laboratory Test Reports:** For paints and coatings, indicating compliance with requirements for low-emitting materials.
- C. **Samples for Initial Selection:** For each type of topcoat product.
- D. **Samples for Verification:** For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. **Product List:** Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. **Furnish extra materials,** from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. **Paint:** 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. **Applicator Qualifications:** A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this project, whose work has resulted in applications with a record or successful in-service performance.
- B. **Source Limitations:** Obtain block fillers and primers 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.
 - 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.
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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 1. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior Painting Schedule for the paint category indicated.

- C. Manufacturer's Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Benjamin Moore & Co. (Benjamin Moore)
 2. ICI Dulux Paint Centers (ICI Dulux Paints)
 3. PPG Industries, Inc. (Pittsburgh Paints)
 4. Sherwin-Williams Co. (Sherwin-Williams)

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
1. Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 2. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 3. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. 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.
- D. Chemical Components of interior paints and coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
1. Interior MPI Gloss Level 1 - Flat paints and coatings: VOC content of not more than 50 g/L.
 2. Interior Non-Flat paints and coatings: VOC content of not more than 150g/L.
 3. Exterior MPI Gloss Level 1 – Flat paints and coatings: VOC content of not more than 100 g/L.
 4. Exterior Non-Flat paints and coatings: VOC content of not more than 200 g/L.
 5. Anticorrosive Coatings: VOC content of not more than 250 g/L.
 6. Varnishes and Sanding sealers: VOC content of not more than 350 g/L.
 7. Stains: VOC content of not more than 250 g/L.

8. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings in the molecular structure).
 9. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein
 - b. Acrylonitrile
 - c. Antimony
 - d. Benzene
 - e. Butyl benzyl phthalate
 - f. Cadmium
 - g. Di (2-ethylhexyl) phthalate
 - h. Di-n-butyl phthalate
 - i. Di-n-octyl phthalate
 - j. 1,2-dichlorobenzene
 - k. Diethyl phthalate
 - l. Dimethyl phthalate
 - m. Ethylbenzene
 - n. Formaldehyde
 - o. Hexavalent chromium
 - p. Isophorone
 - q. Lead
 - r. Mercury
 - s. Methyl ethyl ketone
 - t. Methyl isobutyl ketone
 - u. Methylene chloride
 - v. Naphthalene
 - w. Toluene (methylbenzene)
 - x. 1,1,1-trichloroethane
 - y. Vinyl chloride
- E. VOC Content: For field applications that are inside the weatherproofing system, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 50 g/L.
 3. Dry-Fog Coatings: 150 g/L.
 4. Primers, Sealers, and Undercoaters: 100 g/L.
 5. Rust-Preventive Coatings: 100 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Shellacs, Clear: 730 g/L.
 9. Shellacs, Pigmented: 550 g/L.
- F. Low-Emitting Materials: For field applications that are inside the weatherproofing system, verify 90 percent of paints and coatings comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- G. Colors: As indicated in a color schedule.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 2. Sand surfaces that will be exposed to view, and dust off.
 3. Prime edges, ends, faces, undersides, and backsides of wood.

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

- K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 1. Paint the following work where exposed in equipment rooms. Coordinate painting requirements with MEP specifications:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:

1. Institutional Low-Odor/VOC Latex System MPI INT 3.1M:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
- B. Concrete Substrates, Traffic Surfaces:
 1. Latex Floor Enamel System MPI INT 3.2A:
 - a. Prime Coat: Floor paint, latex, matching topcoat.
 - b. Intermediate Coat: Floor paint, latex, matching topcoat.
 - c. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3), MPI #60.
 2. Water-Based Concrete Floor Sealer System MPI INT 3.2G:
 - a. First Coat: Sealer, water based, for concrete floors, matching topcoat.
 - b. Topcoat: Sealer, water based, for concrete floors, MPI #99.
- C. Cement Board Substrates:
 1. Institutional Low-Odor/VOC Latex System MPI INT 3.3G:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
 2. Alkyd System MPI INT 3.3C:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
- D. Clay Masonry Substrates:
 1. Institutional Low-Odor/VOC Latex System MPI INT 4.1M:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
 - 2. Alkyd System MPI INT 4.1D:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
 - 3. Clear (2-Component) Polyurethane System MPI INT 4.1K:
 - a. Prime Coat: Two-component polyurethane matching topcoat.
 - b. Intermediate Coat: Two-component polyurethane matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane, two-component (MPI Gloss Level 6 or MPI Gloss Level 7), MPI #78.
- E. CMU Substrates:
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 4.2E:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
 - 2. Alkyd System MPI INT 4.2C:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
 - 3. Clear (2-Component) Polyurethane System MPI INT 4.2Q:
 - a. Prime Coat: Two-component polyurethane, matching topcoat.
 - b. Intermediate Coat: Two-component polyurethane, matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane, two component (MPI Gloss Level 6 or MPI Gloss Level 7), MPI #78.
- F. Steel Substrates:
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 5.1S:
 - a. Prime Coat: Primer, rust inhibitive, water based MPI #107.

- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
- 2. Alkyd System MPI INT 5.1E:
 - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
- 3. Alkyd over Shop-Applied Quick-Drying Shop Primer System MPI INT 5.1W:
 - a. Prime Coat: Primer, quick dry, for shop application, MPI #275.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
- 4. Quick-Dry Enamel System MPI INT 5.1A:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
 - b. Intermediate Coat: Alkyd, quick dry, matching topcoat.
 - c. Topcoat: Alkyd, quick dry, semi-gloss (MPI Gloss Level 5), MPI #81.
- 5. Alkyd Dry-Fall System MPI INT 5.1D:
 - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
 - b. Topcoat: Dry fall, alkyd, semi-gloss (MPI Gloss Level 5), MPI #225.
- 6. Alkyd Dry-Fall over Quick-Drying Primer System MPI INT 5.1ZZ:
 - a. Prime Coat: Primer, quick dry, for shop application, MPI #275.
 - b. Topcoat: Dry fall, alkyd, semi-gloss (MPI Gloss Level 5), MPI #225.
- 7. Aluminum Paint System MPI INT 5.1M:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
 - b. Intermediate Coat: Aluminum paint, matching topcoat.
 - c. Topcoat: Aluminum paint, MPI #1.
- G. Galvanized-Metal Substrates:
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 5.3N:

- a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
 2. Water-Based Dry-Fall System MPI INT 5.3H:
 - a. Prime Coat: Dry fall, water based, for galvanized steel, matching topcoat.
 - b. Topcoat: Dry fall, water based, for galvanized steel, flat (MPI Gloss Level 1), MPI #133.
- H. Aluminum (Not Anodized or Otherwise Coated) Substrates:
1. Institutional Low-Odor/VOC Latex System MPI INT 5.4G:
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
 2. Alkyd System MPI INT 5.4A:
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
- I. Copper Substrates:
1. Institutional Low-Odor/VOC Latex System MPI INT 5.5G:
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
 2. Alkyd System MPI INT 5.5A:
 - a. Prime Coat: Primer, vinyl wash, MPI #80.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.

- c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
- J. Stainless Steel Substrates:
 - 1. Alkyd System MPI INT 5.6B:
 - a. Prime Coat: Primer, vinyl wash, MPI #80.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
- K. Wood Substrates: Glued-laminated construction.
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 6.1Q:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
 - 2. Alkyd System MPI INT 6.1B:
 - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
- L. Wood Substrates: Exposed framing.
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 6.2L:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
 - 2. Alkyd System MPI INT 6.2C:
 - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

M. Wood Substrates: Doors.

1. Institutional Low-Odor/VOC Latex System MPI INT 6.3V:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
2. Alkyd System MPI INT 6.3B:
 - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

N. Spray-Textured Ceiling Substrates:

1. Latex, Flat System MPI INT 9.1A: Spray applied.
 - a. Prime Coat: Latex, interior, flat, matching topcoat.
 - b. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.
2. Alkyd, Flat System MPI INT 9.1C:
 - a. Prime Coat: Alkyd, interior, flat matching topcoat.
 - b. Topcoat: Alkyd, interior, flat (MPI Gloss Level 1), MPI #49.

O. Gypsum Board and Plaster Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 9.2M:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 4), MPI #146.
 - d. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
2. Alkyd over Latex Sealer System MPI INT 9.2C:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.

- c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
- P. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings.
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 10.1D:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143.
 - 2. Alkyd System MPI INT 10.1B:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, flat (MPI Gloss Level 1), MPI #49.
 - 3. Aluminum Paint System MPI INT 10.1C:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Aluminum paint matching topcoat.
 - c. Topcoat: Aluminum paint, MPI #1.

END OF SECTION 099123

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Visual display board assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
 - 2. Include electrical characteristics for motorized units.
- B. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:
 - 1. Samples of facings for each visual display panel type, indicating color and texture.
 - 2. Include accessory Samples to verify color selected.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display units to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.9 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 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: 50 or less.
- 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.

2.3 VISUAL DISPLAY BOARD ASSEMBLY (Designations as noted on Drawings)

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide Claridge Products in size and configuration as noted in drawings or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products:
 - 1. Egan Visual
 - 2. AJW Architectural Products
- B. Visual Display Board Assembly: factory fabricated.
 - 1. Assembly: markerboard.
 - 2. Corners: Square.
 - 3. Width: As indicated on Drawings.
 - 4. Height: As indicated on Drawings.
 - 5. Mounting Method: Direct to wall.
- C. Markerboard Panel: High-pressure laminate-faced markerboard panel on core indicated.
 - 1. Color: White.
 - 2. Color and Pattern: As selected by Architect from full range of industry colors.
- D. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; standard size and shape of size and shape indicated on Drawings.
 - 1. Aluminum Finish: Clear anodic finish.
- E. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
- F. Chalk tray: Manufacturer's standard; continuous.
 - 1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
 - 2. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

2.4 MARKERBOARD PANELS

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide Products as noted in drawings or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products:
 - 1. Claridge Products
 - 2. Egan Visual
 - 3. AJW Architectural Products
- B. High-Pressure-Laminate Markerboard Panels: Factory-laminated markerboard panel of three-ply construction, consisting of backing, fiberboard core material, and high-pressure-laminate writing surface.

2.5 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. High-Pressure Plastic Laminate: NEMA LD 3.
- C. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd.; with surface-burning characteristics indicated.
- D. Hardboard: ANSI A135.4, tempered.
- E. Particleboard: ANSI A208.1, Grade M-1.
- F. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
- G. Fiberboard: ASTM C 208 cellulosic fiber insulating board.
- H. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- I. Extruded Aluminum: ASTM B 221, Alloy 6063.
- J. Adhesives for Field Application: Mildew-resistant, non-staining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
 - 1. **Adhesives shall have a VOC** content of 50 g/L or less.

2.6 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 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.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603, except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
- C. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

SECTION 101423.13 - ROOM-IDENTIFICATION SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.

1.3 ALLOWANCES

- A. Allowances for signage are specified in Section 012100 "Allowances."

1.4 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.5 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Room-Identification Signs: Full-size Sample.
 - 2. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
 - 3. Exposed Accessories: Full-size Sample of each accessory type.
 - 4. Full-size Samples, if approved, will be returned to Contractor for use in Project.
- E. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.7 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

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

1.9 MAINTENANCE MATERIAL SUBMITTALS

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

1. Variable Component Materials: 12 replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
2. Tools: One set(s) of specialty tools for assembling signs and replacing variable sign components.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign: Sign system with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 1. The Southwell Co, San Antonio, Texas
 2. Executive Signs, San Antonio, Texas

3. SignsNow, San Antonio, Texas
4. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
 - b. Surface-Applied Graphics: Applied vinyl film.
 - c. Color(s): As selected by Architect from manufacturer's full range.
5. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Beveled.
 - b. Corner Condition in Elevation: Rounded to radius indicated.
6. Mounting: Manufacturer's standard method for substrates indicated with concealed anchors.
7. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range.

2.3 SIGN MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- D. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings.
- E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:

- a. Fabricated from same basic metal and finish of fastened sign unless otherwise indicated.
 - b. Fastener Heads: Use flathead screws and bolts with tamper-resistant slots unless otherwise indicated.
- 4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
 - b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
- D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.
- E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

- D. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert.
 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert.
 3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
- B. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
5. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips 0.250 inch away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.
6. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.

CONSTRUCTION DOCUMENTS
SPECIFICATIONS
ISSUED FOR CONSTRUCTION

CAMINO REAL WORK FORCE CTR
RENOVATION & EXPANSION PROJ.

ROOM-IDENTIFICATION
SIGNAGE
10142313

- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423.13

SECTION 102113.14 - STAINLESS-STEEL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section includes stainless-steel toilet compartments configured as toilet enclosures and urinal screens.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 061000 "Rough Carpentry" for blocking.
 - 3. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.3 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
 - B. Shop Drawings: For toilet compartments.
 1. Include plans, elevations, sections, details, and attachment details.
 2. Show locations of cutouts for compartment-mounted toilet accessories.
 3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
 4. Show locations of centerlines of toilet fixtures.
 5. Show locations of floor drains.
 - C. Samples for Initial Selection: For each type of toilet compartment material indicated.
 1. Include Samples of hardware and accessories involving material and color selection.
 - D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
 2. Each type of hardware and accessory.
 - E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Product Certificates: For each type of toilet compartment.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For toilet compartments to include in maintenance manuals.
- 1.6 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.
 1. Door Hinges: One hinge(s) with associated fasteners.
 2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
 3. Door Bumper: One door bumper(s) with associated fasteners.
 4. Door Pull: One door pull(s) with associated fasteners.
 5. Fasteners: Ten fasteners of each size and type.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.
- 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 STAINLESS-STEEL TOILET COMPARTMENTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Products as noted in drawings or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products:
 - 1. ASI Global Partitions
 - 2. American Specialties
- B. Toilet-Enclosure Style: Floor anchored.
- C. Urinal-Screen Style: Wall hung and floor mounted flat panel.
- D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Provide with no-sightline system. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
 - 1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
 - 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand applied downward load on grab bar of at least 250 lbf, when tested according to ASTM F 446, without deformation of panel.
 - 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

- E. Urinal-Screen Construction:
 - 1. Flat-Panel Urinal Screen: Matching panel construction.
- F. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:
 - 1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch.
 - 2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than 0.050 inch.
 - 3. Panels: Manufacturer's standard thickness, but not less than 0.031 inch.
 - 4. Doors: Manufacturer's standard thickness, but not less than 0.031 inch.
 - 5. Flat-Panel Urinal Screens: Thickness matching the panels.
- G. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
- H. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe and sleeve (cap) matching that on the pilaster.
- I. Brackets (Fittings):
 - 1. Stirrup Type: Ear or U-brackets; stainless steel.
- J. Stainless-Steel Finish: Type 304 No. 4 brushed, directional polish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
 - 1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through-bolts.
 - 2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
 - 3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
 - 4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.

5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

- 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. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- B. Stainless-Steel Castings: ASTM A 743/A 743M.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.
- B. 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.
- C. 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.
- D. 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 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 two brackets attached 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. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 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 102113.14

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wall guards.
 - 2. Corner guards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
 - 2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.
- B. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.

1. Include Samples of accent strips and accessories to verify color selection.
- C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
 1. Wall Guards: 12 inches long. Include examples of joinery, corners, end caps, top caps, and field splices.
 2. Corner Guards: 12 inches long. Include example top caps.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of handrail.
- B. Material Certificates: For each type of exposed plastic material.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch-long units.
 2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store corner-guard covers in a vertical position.
 - b. Store wall-guard covers in a horizontal position.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; 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.

2.3 WALL GUARDS

- A. Crash Rail: Heavy-duty, PVC-free assembly consisting of continuous snap-on plastic cover installed over concealed retainer; designed to withstand impacts.
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 Floor Products Company, Inc.**
 - b. **Korogard Wall Protection Systems; a division of RJF International Corporation.**
 - c. **WallGuard.com.**
 2. Cover: Extruded rigid plastic, minimum 0.100-inch wall thickness; as follows:
 - a. Profile: Flat.
 - 1) Dimensions: Nominal 6 inches high by 1 inch deep.
 - 2) Surface: Uniform with coextruded accent inlay strip in contrasting color.
 - a) Accent Inlay Strip: Nominal 2 inches high by length of rail.
 - b. Color and Texture: As noted on dwgs.
 3. Continuous Retainer: Minimum 0.080-inch-thick, one-piece, extruded aluminum.
 4. Retainer Clips: Manufacturer's standard impact-absorbing clips designed for heavy-duty performance.
 5. Bumper: Continuous, resilient bumper cushion(s).
 6. End Caps and Corners: Prefabricated, injection-molded plastic; matching color cover; field adjustable for close alignment with snap-on cover.
 7. Accessories: Concealed splices and mounting hardware.
 8. Mounting: Surface mounted directly to wall.

2.4 CORNER GUARDS

- A. Surface-Mounted, Plastic-Cover Corner Guards: Manufacturer's standard, PVC-free assembly consisting of snap-on, resilient plastic cover installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
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 Floor Products Company, Inc.**
 - b. **Korogard Wall Protection Systems; a division of RJF International Corporation.**
 - c. **WallGuard.com.**

2. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness; in dimensions and profiles indicated on Drawings.
 - a. Profile: Nominal 2-inch-long leg and 1/4-inch corner radius.
 - b. Height: 4 feet.
 - c. Color and Texture: As selected by Architect from manufacturer's full range.
3. Continuous Retainer: Minimum 0.060-inch-thick, one-piece, extruded aluminum.
4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.5 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Polycarbonate Plastic Sheet: ASTM D6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. of notch when tested according to ASTM D256, Test Method A.
- C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- D. Adhesive: As recommended by protection product manufacturer.
 1. Adhesives shall have a VOC content of 70 g/L or less.

2.6 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.7 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.

3. Adjust end and top caps as required to ensure tight seams.

C. Fire Doors: Install protection according to the listing of each item.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.
 - 3. Private-use bathroom accessories.
 - 4. Warm-air dryers.
 - 5. Underlavatory guards.
 - 6. Custodial accessories.
- B. Related Sections:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.

2. Section 093000 "Tiling" for ceramic toilet and bath accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 1. Construction details and dimensions.
 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 3. Material and finish descriptions.
 4. Features that will be included for Project.
 5. Manufacturer's warranty.
- B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 1. Identify locations using room designations indicated.
 2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products 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.

1.7 COORDINATION

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

1.8 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: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. [A & J Washroom Accessories, Inc.](#)
 - 2. [American Specialties, Inc.](#)
 - 3. [Bobrick Washroom Equipment, Inc.](#)
 - 4. [Bradley Corporation.](#)
 - 5. [GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.](#)
 - 6. [Tubular Specialties Manufacturing, Inc.](#)

B. Soap Dispenser:

1. Basis-of-Design Product: Bobrick; B-8221.
2. Description: Designed for dispensing soap in liquid or lotion form.
3. Mounting: Deck mounted on vanity.
4. Capacity: 20 oz.
5. Materials: 6" spout.

C. Grab Bar:

1. Basis-of-Design Product: Bobrick; B6806.99x 36, B6806.99x 42, B6806.99x18, B6806.99x24, B6806.99x52.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

D. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: Bobrick; B-4354, B-4353.
2. Mounting: Recessed and Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

E. Mirror Unit:

1. Basis-of-Design Product: Bobrick; B-290.
2. Frame: Stainless-steel channel.
 - a. Corners: Manufacturer's standard.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: As indicated on Drawings.

F. Combination Towel (Folded) Dispenser/Waste Receptacle:

1. Basis-of-Design Product: Bobrick; B-3961.
2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
3. Mounting: Recessed with projecting receptacle.
 - a. Designed for nominal 4-inch wall depth.
4. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
5. Minimum Waste-Receptacle Capacity: 12 gal.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
7. Liner: Reusable, vinyl waste-receptacle liner.
8. Lockset: Tumbler type for towel-dispenser compartment and waste receptacle.

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
6. Tubular Specialties Manufacturing, Inc.

- B. Folding Shower Seat:

1. Basis-of-Design Product: ASI American Specialties / 8203-33.
2. Configuration: L-shaped seat, designed for wheelchair access.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color (Ivory) as selected by Architect.
4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
5. Dimensions: 33"x 22".

2.4 PRIVATE-USE BATHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Basco, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Franklin Brass by Liberty Hardware Manufacturing Corporation; a Masco company.
4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.

5. [Ginger; a Masco company.](#)
6. [Seachrome Corporation.](#)
7. [Tubular Specialties Manufacturing, Inc.](#)

B. Toilet Paper Dispenser:

1. Basis-of-Design Product: Bobrick; B-4288.
2. Description: Double-roll dispenser.
3. Mounting: Surface mounted.
4. Capacity: Designed for 4-1/2- or 5-inch-diameter tissue rolls.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Shower Curtain Rod:

1. Basis-of-Design Product: Bobrick, B-6047.
2. Outside Diameter: 1-1/4 inches.
3. Mounting: Flanges with concealed fasteners.
4. Rod Material and Finish: Stainless steel, No. 4 finish (satin).
5. Flange Material and Finish: Stainless steel, No. 4 finish (satin).
6. Accessories: Integral chrome-plated brass glide hooks.

D. Clothes Hook :

1. Basis-of-Design Product: Bobrick; B-212.
2. Description: Single-prong unit.
3. Material and Finish: Stainless steel, No. 4 finish (satin).

2.5 WARM-AIR DRYERS

A. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. [A & J Washroom Accessories, Inc.](#)
2. [American Dryer, Inc.](#)
3. [American Specialties, Inc.](#)
4. [Bobrick Washroom Equipment, Inc.](#)
5. [Bradley Corporation.](#)
6. [Excel Dryer Corporation.](#)
7. [GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.](#)
8. [Tubular Specialties Manufacturing, Inc.](#)
9. [World Dryer Corporation.](#)

B. Warm-Air Dryer:

1. Basis-of-Design Product: Excel; Dyson / Airblade V / HU02 – 307172-01.
2. Mounting: Surface mounted.
3. Operation: Electronic-sensor activated with timed power cut-off switch.
 - a. Operation Time: 30 to 40 seconds.
4. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
5. Electrical Requirements: As required from electrical drawings.

2.6 UNDERLAVATORY GUARDS

- 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. [Plumberex Specialty Products, Inc.](#)
 2. [Truebro by IPS Corporation.](#)
- B. Underlavatory Guard :
 1. 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.
 2. Material and Finish: Antimicrobial, molded plastic, white.

2.7 CUSTODIAL ACCESSORIES

- 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. [A & J Washroom Accessories, Inc.](#)
 2. [American Specialties, Inc.](#)
 3. [Bobrick Washroom Equipment, Inc.](#)
 4. [Bradley Corporation.](#)
 5. [GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.](#)
 6. [Tubular Specialties Manufacturing, Inc.](#)
- C. Mop and Broom Holder :
 1. Basis-of-Design Product: Bobrick; B-239x 34.
 2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
 3. Length: 36 inches.
 4. Hooks: Three minimum.

5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
 - b. Rod: Approximately 1/4-inch-diameter stainless steel.

2.8 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

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. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104413 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Sections:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 104416 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, and cabinet type, trim style, and panel style.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For each type of fire protection cabinet indicated.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Size: 6 by 6 inches square.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire protection cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.6 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.7 SEQUENCING

- A. Apply decals and/ or vinyl lettering on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 6 mm thick, with Finish 1 (smooth or polished).

2.2 FIRE PROTECTION CABINET FE CAB.

- A. [Basis-of-Design Product](#): Subject to compliance with requirements, provide A-1 Fire & Safety, Model Recessed A11816G10-031 / Surface Mounted A11013V10-031 or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products
- B. Cabinet Type: Suitable for fire extinguisher.
 - 1. **Products**: Subject to compliance with requirements, provide one of the following :
 - a. Southwest Fire Protection
 - b. Koetter Fire Protection of San Antonio, LLC
 - c. A-1 Fire & Safety
 - d. Fire Service Pro, LLC
- C. Cabinet Construction: 1-hour fire rated.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.
- D. Cabinet Material: Stainless Steel Finish.
 - 1. Shelf: Same metal and finish as cabinet.
- E. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
- F. Cabinet Trim Material: Steel sheet.
- G. Door Material: Steel sheet.
- H. Door Style: Fully glazed panel with frame.
- I. Door Glazing: Acrylic sheet.
 1. Acrylic Sheet Color: Clear transparent acrylic sheet.
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 1. Provide manufacturer's standard.
 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- K. Accessories:
 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Decals and/ or Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.
 4. Alarm: Manufacturer's standard alarm that actuates when fire protection cabinet door is opened and that is powered by batteries.
- L. Finishes:
 1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet, door and trim except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet and door.

2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
 - 3. Prepare doors and frames to receive locks.
 - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 - 2. Fabricate door frames of one-piece construction with edges flanged.
 - 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 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 of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. 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.

2.5 STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
- C. Identification: Apply decals and/ or vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturers written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

CONSTRUCTION DOCUMENTS
SPECIFICATIONS
ISSUED FOR CONSTRUCTION

CAMINO REAL WORK FORCE CTR
RENOVATION & EXPANSION PROJ.

FIRE EXTINGUISHER CABINETS
104413

- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FMG.
- C. Pre-installation Conference: Conduct conference at Project site.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
 - a. Southwest Fire Protection
 - b. Koetter Fire Protection of San Antonio, LLC
 - c. A-1 Fire & Safety
 - d. Fire Service Pro, LLC
 - 2. Valves: Manufacturer's standard.
 - 3. Handles and Levers: Manufacturer's standard.

4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Regular Dry-Chemical Type in Aluminum Container: UL-rated 120-B: C, 20-lb nominal capacity, with sodium bicarbonate-based dry chemical in enameled-aluminum container.

2.2 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
 - a. Southwest Fire Protection
 - b. Koetter Fire Protection of San Antonio, LLC
 - c. A-1 Fire & Safety
 - d. Fire Service Pro, LLC
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Welded corridor lockers.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

- B. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- C. Samples: For each color specified, in manufacturer's standard size.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.
- E. Samples for Verification: For the following products, in manufacturer's standard size:
 - 1. Lockers and equipment.
- F. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 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.
 - 1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
 - a. Locks.
 - b. Identification plates.
 - c. Hooks.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

- B. Deliver master and control keys to Owner by registered mail or overnight package service

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.10 COORDINATION

- A. Coordinate sizes and locations of bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.
 - 4. Warranty Period for Welded Metal Lockers: Lifetime from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers, and accessories from single source from single locker manufacturer.
 - 1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

2.3 WELDED LOCKERS (Designations as noted on Drawings)

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide Products by Hadrian Manufacturing as noted in drawings or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products:
1. ASI Storage Solutions
 2. Scranton Products
- B. Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
 2. Door Style: Vented panel as follows:
 - a. Louvered Vents: No fewer than three louver openings at top and bottom for double-tier lockers.
 - b. Security Vents: Manufacturer's standard, stamped horizontal or vertical.
- C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops, Bottoms, and Sides: 0.060-inch nominal thickness.
 2. Backs: 0.048-inch nominal thickness.
 3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.
- D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; self-closing.

1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
 2. Continuous Hinges: Manufacturer's standard, steel, full height.
 3. Hinges: Manufacturer's standard, steel, continuous or knuckle type.
- F. Projecting Door Handle and Latch: Finger-lift latch control designed for use with either built-in combination locks or padlocks; positive automatic latching, chromium plated; pry and vandal resistant.
1. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
 2. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- G. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.120-inch nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
 2. Single-Point Latching: Nonmoving latch hook designed to engage bolt of built-in combination or cylinder lock with steel padlock loop that projects through recessed cup and is finished to match metal locker body.
 - a. Latch Hook: Equip each door with one latch hook, fabricated from 0.120-inch nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.
- H. Door Handle and Latch for Box Lockers: Stainless-steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- I. Locks: Combination padlocks.

- J. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.
- K. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.
- L. Coat Rods: Manufacturer's standard.
- M. Coat Rods: 1-inch-diameter steel, chrome finished.
- N. Legs: 6 inches high; formed by extending vertical frame members, or fabricated from 0.075-inch nominal-thickness steel sheet; welded to bottom of locker.
 - 1. Closed Front and End Bases: Fabricated from 0.036-inch nominal-thickness steel sheet.
- O. Continuous Zee Base: Fabricated from, manufacturer's standard thickness, but not less than 0.060-inch nominal-thickness steel sheet.
- P. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
- Q. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.
- R. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
- S. Boxed End Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
- T. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - 2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.
 - 3. **Recycled Content**: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.
- U. Finish: Baked enamel or powder coat.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 LOCKS

- A. Provide locks and other accessories from same manufacturer as locker system.
- B. Built-in Combination Locks: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key.
 - 1. Bolt Operation: Manually locking deadbolt.

- C. Cylinder Locks: Built-in, flush, cam locks with five-pin tumbler keyway, keyed separately and master keyed. Furnish two change keys for each lock and two master keys.
 - 1. Key Type: Flat.
 - 2. Bolt Operation: Manually locking deadbolt.

2.5 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 - 1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
 - 2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
 - 3. Triple-Tier Units: One double-prong ceiling hook.
 - 4. Coat Rods: For each compartment of each locker.
 - 5. Open-Front Athletic Lockers: Two single-prong wall hooks bolted to locker back and coat rod.
- D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- E. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
- F. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.
- G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
 - 1. Sloping-top corner fillers, mitered.

- H. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.
- I. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.
- J. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- K. Boxed End Panels: Fabricated with 1-inch-wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
 - 1. Provide one-piece panels for double-row (back-to-back) locker ends.
- L. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
 - 1. Provide one-piece panels for double-row (back-to-back) locker ends.
- M. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.6 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top of lockers and to floor.
 - 3. Anchor back-to-back metal lockers to floor.
- B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
- C. Equipment:
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with at least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach recess trim to recessed metal lockers with concealed clips.
 - 2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 - 3. Attach sloping-top units to metal lockers, with closures at exposed ends.
 - 4. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
 - 5. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 105613 - METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Case-type metal storage shelving.
 - 2. Post-and-beam metal storage shelving.

1.3 COORDINATION

- A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.
- B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.
- B. Shop Drawings: For metal storage shelving.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include installation details of connectors, lateral bracing, and special bracing.
- C. Samples: For each type of metal storage shelving and for each color specified, in the following sizes:
 - 1. Vertical Supports: 12 inches tall.
 - 2. Shelves: Full size, but not more than 24 inches wide by 12 inches deep.
 - 3. Connectors: Full size.
 - 4. Shelf-Label Holders: Full size.
- D. Samples for Initial Selection: For each type of metal storage shelving with factory-applied color finishes.
 - 1. Include Samples of accessories involving color selection.
- E. Samples for Verification: For the following components, of size indicated below:
 - 1. Vertical Supports: 12 inches tall.
 - 2. Shelves: Full size, but not more than 24 inches wide by 12 inches deep.
 - 3. Connectors: Full size.
 - 4. Shelf-Label Holders: Full size.
- F. Product Schedule: For metal storage shelving. Use same designations indicated on Drawings.
- G. Delegated-Design Submittal: For seismic restraint of metal storage shelving.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For metal storage shelving, accessories, and components, from manufacturer.

- C. Product Certificates: For each type of metal storage shelving.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.8 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.
 - 1. Shelves: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 5 shelves.
 - 2. Shelf-to-Post Connectors: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 connectors.
 - 3. Shelf-Label Holders: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 holders.

1.9 QUALITY ASSURANCE

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

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal storage shelving, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Seismic Performance: Metal storage shelving shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Seismic Component Importance Factor: 1.5.

2.2 POST-AND-BEAM METAL STORAGE SHELVING (Designations as noted on Drawings)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Madix PRFWGND (ND)(NL)-3 or comparable product by one of the following. Selection of color, style, model or other product characteristics shall be by architect from manufacturer's full range of products
- B. Post-and-Beam Metal Shelving: Complying with MH 28.2; field-assembled from factory-formed components. Shelves are supported by beams that span between supporting corner posts that allow beam-height adjustment over full height of shelving unit. Provide fixed top and bottom beams, adjustable intermediate beams, and accessories indicated.
 - 1. Advance Storage Products
 - 2. Madix Store Fixtures
- C. Load-Carrying Capacity per Shelf: 1000 lb, uniformly distributed.
- D. Posts: Fabricated from cold-rolled steel; in manufacturer's standard shape; with perforations at 1-1/2 inches o.c. to receive beam-to-post connectors.
 - 1. Unit Configuration: Configure shelving units as individual, freestanding assemblies.
 - 2. Steel Thickness, Nominal: As required for load-carrying capacity per shelf and number of shelves.
 - a. Add-On Shelf Posts: Fabricated from hot-rolled steel, T-shape; perforated to match main posts and of same thickness.
 - 3. Post Base: Cold-rolled steel floor plate, drilled for floor anchors.
- E. Beams: Fabricated from cold-rolled steel; in manufacturer's standard shape. Provide beam at each side of each shelf, with center supports as required for load-carrying capacity of shelf.
 - 1. Steel Thickness, Nominal: As required for load-carrying capacity per shelf.
 - 2. Beam-to-Post Connectors: Projecting manufacturer's standard at each end that engage posts.
 - a. Top and Bottom Shelf Beams: Provide with double beam-to-post connectors.
 - b. Intermediate Shelf Beams: Provide with double beam-to-post connectors.
 - 3. Beam Quantity: As required for number of shelves indicated per shelving unit.
- F. Particleboard Shelves: 5/8 inch thick; factory cut.
- G. Shelf Quantity: Three shelves per shelving unit in addition to top and bottom shelf.
- H. Overall Unit Width: As noted on drawings.
- I. Overall Unit Depth: As noted on drawings.
- J. Overall Unit Height: As noted on drawings.

K. Accessories:

1. Tie Plates: Cold-rolled steel, finished to match posts; designed for joining posts of adjacent shelving units.
2. Supports: Back-to-wall type that bolt to posts; as required for shelving unit stability.

L. Steel Finish: Baked enamel or powder coat.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 ANCHORS

- A. Floor Anchors: Galvanized-steel, post-installed expansion anchors. Provide number per unit recommended by manufacturer unless additional anchors are indicated in calculations.
- B. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide one per shelving unit for each shelving unit adjacent to a wall unless additional anchors are indicated in calculations.

2.4 FABRICATION

- A. Fabricate metal storage shelving components to provide field-assembled units that are square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.
1. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 2. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
 3. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.
- B. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work. Form backs of shelving units of up to 48 inches wide from one piece.
- C. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch. Shear and punch metals cleanly and accurately. Remove burrs.
- D. Weld corners and seams continuously to develop strength, minimize distortion, and maintain the corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so surface is smooth after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine floors for suitable conditions where metal storage shelving will be installed.
- C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum and clean finished floor over which metal storage shelving is to be installed.

3.3 INSTALLATION

- A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.
 - 1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
 - 3. Adjust post-base bolt leveler to achieve level and plumb installation.
 - 4. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.
 - 5. Install seismic restraints.
 - 6. Connect side-to-side shelving units together.
 - 7. Install shelves in each shelving unit at equal spacing.
 - a. Case-Type Metal Storage Shelving: Install adjustable shelf clips at front and back of each shelf.
 - b. Four-Post Metal Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.
 - c. Post-and-Beam Metal Storage Shelving: Install beams with beam-to-post connectors fully engaged in post perforations.
- B. Accessories:
 - 1. Install finished end panels and trim at exposed ends of shelving units.
 - 2. Shelf-Label Holders: Install one on each shelf.

- a. Install centered vertically aligned within each shelving unit.
- 3. Back Ledges: Install one per shelf.
- 4. Side Ledges: Install on each side of each shelf.

3.4 ERECTION TOLERANCES

- A. Erect case-type and four-post metal storage shelving to a maximum tolerance from vertical of 1/2 inch in up to 10 feet of height, not exceeding 1 inch for heights taller than 10 feet.
- B. Erect post-and-beam metal storage shelving to a maximum tolerance from vertical of 1/4 inch in 84 inches of height.

3.5 ADJUSTING

- A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.
- B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.
- C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.
- D. Replace metal storage shelving components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105613

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Horizontal louver blinds with aluminum slats.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.3 ACTION SUBMITTALS

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

- B. Samples: For each exposed product and for each color and texture specified, 12 inches long.
- C. Samples for Initial Selection: For each type and color of horizontal louver blind.
 - 1. Include Samples of accessories involving color selection.
- D. Samples for Verification: For each type and color of horizontal louver blind indicated.
 - 1. Slat: Not less than 12 inches long.
 - 2. Tapes: Full width, not less than 6 inches long.
 - 3. Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.
 - 4. Valance: Full-size unit, not less than 12 inches wide.
- E. Product Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Horizontal Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and gloss indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide horizontal aluminum blinds by Hunter Douglas as noted on drawings, or comparable product by one of the following:
 - 1. Levolor
 - 2. Smith & Noble
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
 - 1. Width: 1 inch.
 - 2. Thickness: Manufacturer's standard.
 - 3. Spacing: Manufacturer's standard.
 - 4. Finish: Ionized antistatic, dust-repellent, baked polyester finish.
 - 5. Features:
 - a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.
 - b. Perforated Slats: Openness factor of 6 to 7 percent.

- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
 - 1. Capacity: One blind(s) per headrail unless otherwise indicated.
 - 2. Ends: Manufacturer's standard.
 - 3. Manual Lift Mechanism:
 - a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
 - b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
 - 4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - a. Tilt: Full.
 - b. Operator: Dual cord.
 - c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
 - 5. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard.
 - 6. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard unless otherwise indicated.
 - 7. Integrated Headrail/Valance: Manufacturers standard.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
 - 1. Type: Manufacturer's standard.
- E. Lift Cords: Manufacturer's standard braided cord.
- F. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
 - 1. Type: Braided cord.
- G. Valance: Manufacturer's standard.
- H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: Overhead.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- I. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- J. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.

K. Colors, Textures, Patterns, and Gloss:

1. Slats: As selected by Architect from manufacturer's full range.
2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

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. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
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 dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.
 2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish:
1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
 - 2. Install mounting and intermediate brackets to prevent deflection of headrails.
 - 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION 122113

SECTION 123216 - MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-clad casework.
 - 2. Casework hardware and accessories.
- B. Related Requirements:
 - 1. This list of sections is applicable but not all inclusive. See other sections as required for the completion of the Work. The following documents include related requirements for the Work of this section and every other section affected by the Work.
 - 2. Section 061000 "Rough Carpentry" for wood blocking for anchoring casework.
 - 3. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
 - 4. Section 096513 "Resilient Base and Accessories" for resilient base applied to plastic-laminate-clad casework.

1.3 DEFINITIONS

- A. Definitions in the AWI/AWMAC/WI's "Architectural Woodwork Standards" apply to the Work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.

1.5 COORDINATION

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

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For plastic-laminate-clad casework.
 - 1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
 - 2. Indicate types and sizes of casework.
 - 3. Indicate manufacturer's catalog numbers for casework.
 - 4. Show fabrication details, including types and locations of hardware.
 - 5. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.
 - 6. Apply AWI's Quality Certification Program label to Shop Drawings.
- C. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.
- D. Samples for Initial Selection: For casework and hardware finishes.
- E. Samples for Verification: For the following:
 - 1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.
 - a. Provide one Sample applied to core material with specified edge material applied to one edge.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For casework manufacturer and Installer.
- B. Sample Warranty: For special warranty.
- C. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI's Quality Certification Program certificates.

1.9 QUALITY ASSURANCE

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

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during remainder of construction period. Maintain temperature and relative humidity during remainder of construction period in range recommended for Project location by the AWI/AWMAC/WI's "Architectural Woodwork Standards."
- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
- D. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of components or other failures of glue bond.
 - b. Warping of components.
 - c. Failure of operating hardware.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain from single source from single manufacturer.

2.2 GENERAL REQUIREMENTS FOR CASEWORK

- A. Quality Standard: Unless otherwise indicated, comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.
 - 1. Grade: Custom.
 - 2. Provide labels and certificates from AWI certification program indicating that casework complies with requirements of grades specified.
 - a. Contractor shall register the Work under this Section with AWI's Quality Certification Program at www.awiqcp.org or by calling 855-345-0991.
- B. Product Designations: Drawings indicate sizes, configurations, and finish materials of manufactured plastic-laminate-clad casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish materials, and complying with the Specifications may be considered. See Section 016000 "Product Requirements."

2.3 PLASTIC-LAMINATE-CLAD CASEWORK

- A. Design: Frameless cabinet construction with the following door and drawer-front style:
 - 1. Flush overlay.
- B. Grain Direction for Wood-Grain Plastic Laminate:

1. Doors: Vertical with continuous vertical matching.
2. Drawer Fronts: Vertical with continuous vertical matching.
3. Face Frame Members: Lengthwise.
4. End Panels: Vertical.
5. Bottoms and Tops of Units: Side to side.
6. Knee Space Panels: Vertical.
7. Aprons: Horizontal.

C. Exposed Materials:

1. Plastic-Laminate Grade: HGS.

D. Semiexposed Materials:

1. Plastic Laminate: Grade VGS unless otherwise indicated. Provide plastic laminate for semiexposed surfaces unless otherwise indicated.
 - a. Colors and Patterns: As noted on drawings..

E. Concealed Materials:

1. Plywood: Hardwood plywood.
2. Particleboard.
3. MDF.

2.4 CABINET HARDWARE AND ACCESSORIES

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.

1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.

B. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, Type B01602, self-closing. Provide two hinges for doors less than 48 inches high, and provide three hinges for doors more than 48 inches high.

1. Degrees of Opening: 135 degrees.

C. Wire Pulls: Solid stainless steel chrome-plated brass wire pulls, fastened from back with two screws.

1. For sliding doors, provide recessed stainless steel flush pulls.
2. Provide two pulls for drawers more than 24 inches wide.

D. Door and Drawer Bumpers: Self-adhering, clear silicone rubber.

1. Doors: Provide one bumper at top and bottom of closing edge of each swinging door.

2. Drawers: Provide one bumper on back side of drawer front at each corner.

E. Drawer Slides: ANSI/BHMA A156.9, Type B05091.

1. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted and extending under the bottom edge of drawer.
 - a. Extension Type: Full.
 - b. Material: Zinc-plated steel with polymer rollers.
2. Box Drawer Slides: Grade 1, for drawers not more than 6 inches high and 24 inches wide.
3. File Drawer Slides: Grade 1HD-100, for drawers more than 6 inches high or 24 inches wide.
4. Pencil Drawer Slides: Grade 1, for drawers not more than 3 inches high and 24 inches wide.
5. Keyboard Slides: Grade 1, for computer keyboard shelves.
6. Trash Bin Slides: Grade 1HD-100, for trash bins not more than 20 inches high and 16 inches wide.

F. Drawer and Hinged-Door Locks: Cylindrical (cam) type, five-pin tumbler, brass with chrome-plated finish, and complying with ANSI/BHMA A156.11, Grade 1.

1. Provide a minimum of two keys per lock and six master keys.
2. Provide locks on every door and drawer.
 - a. Masterkey for up to 500 key changes.

G. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door unit.

H. Adjustable Shelf Supports: Two-pin-locking plastic shelf rests complying with ANSI/BHMA A156.9, Type B04013.

2.5 MATERIALS

- A. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
- B. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.
- C. Softwood Plywood: DOC PS 1.
- D. Particleboard: ANSI A208.1, Grade M-2.
- E. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130.
- F. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
 1. Source Limitations: Obtain from single source from single manufacturer.

2.6 FABRICATION

- A. Plastic-Laminate-Clad Cabinet Construction: As required by referenced quality standard, but not less than the following:
 - 1. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch particleboard.
 - 2. Shelves: 3/4-inch-thick particleboard.
 - 3. Backs of Casework: 1/2-inch-thick particleboard or MDF where exposed, 1/4-inch-thick hardboard dadoed into sides, bottoms, and tops where not exposed.
 - 4. Drawer Fronts: 3/4-inch particleboard.
 - 5. Drawer Sides and Backs: 1/2-inch-thick solid-wood or veneer-core hardwood plywood, with glued dovetail or multiple-dowel joints.
 - 6. Drawer Bottoms: 1/4-inch-thick hardwood plywood glued and dadoed into front, back, and sides of drawers. Use 1/2-inch material for drawers more than 24 inches wide.
 - 7. Drawer Bodies: Steel drawer pans formed from 0.0359-inch-thick metal, metallic phosphate treated, and finished with manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of 1 mil for topcoat and 2 mils for system.
 - 8. Doors 48 Inches High or Less: 3/4 inch thick, with particleboard or MDF cores.
- B. Filler Strips: Provide as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as casework.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Grade: Install casework to comply with same quality standard grade as item to be installed.
- B. Install casework level, plumb, and true in line; shim as required using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

- C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten cabinets to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch.
- E. Fasten casework to adjacent units and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards."
- F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- G. Adjust operating hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 1. Inspection entity shall prepare and submit report of inspection.

3.4 CLEANING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 123216

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related documents contain additional requirements for bidding, pricing, planning, coordinating, fabricating, installing, finishing, and completing the Work identified in this Section.
- C. For completion of the Work of this Section, all related documents must be examined by the Contractor, and requirements contained in other areas of the Contract Documents relating to the Work of this Section shall be incorporated into the Work of this Section.
- D. Additional requirements in the related documents include, but are not limited to, material and system quantity, location, placement, mounting, orientation, extents, proximity, and/or connection to other materials and systems to achieve the requirements of the Section and the requirements of adjacent and related work.
- E. Refer to Section 01 1113 - Work Covered by Contract Documents at the article entitled "GENERAL NOTES" for the paragraph entitled "Related Documents" regarding an expanded/explanatory version of the "RELATED DOCUMENTS" and for additional project requirements at other articles and paragraphs.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops.
 - 2. Solid surface material backsplashes.

1.3 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.
2. Wood trim, 8 inches long.
3. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material 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.

1.6 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.
- C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
1. Build mockup of typical countertop as shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide solid surface material by Wilsonart as noted on drawings, or comparable product by one of the following:
1. Corian
 2. Affinity Surfaces.
 3. Formica
- B. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
1. Type: Provide Standard type unless Special Purpose type is indicated.
 2. Integral Sink Bowls: Comply with CSA B45.5/IAPMO Z124.
 3. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
1. Grade: Custom.
- B. Configuration:
1. Front: 3/4-inch bullnose.
 2. Backsplash: Radius edge with 3/8-inch radius.
 3. End Splash: Matching backsplash.
- C. Countertops: 3/4-inch-thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch-thick, solid surface material.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
1. Fabricate with loose backsplashes for field assembly.
 2. Install integral sink bowls in countertops in the shop.
- F. Joints: Fabricate countertops without joints.
- G. 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 3/16 inch into fixture opening.
 - b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
 - c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
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.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material 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 solid surface material 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. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- D. 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.
- E. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- G. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 220006

PLUMBING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. Remove or Demolish: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner cleaned, packaged, and ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
 - 1. Coordinate with Owner's representative, who will establish special procedures for removal and salvage.

1.4 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services (including but not limited to: Gas, Water, Fire Suppression, Chilled Water, Hot Water, Air Conditioning, etc).
 - 4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 5. Means of protection for items to remain and items in path of waste removal from building.

- B. Inventory: After selective demolition is complete, submit a list of items that have been salvaged.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.6 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 3. Maintain adequate ventilation when using cutting torches.
 - 4. Dispose of demolished items and materials promptly.

- B. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- E. Contractor shall terminate demolished pipe and/or ductwork. System shall be capped and insulated per new work specification.
- F. Contractor shall remove any abandoned piping and/or ductwork in area of construction during the demolition process.
- G. Unforeseen Conditions
 - 1. Any unforeseen utilities found during construction that directly affect any trade must be brought to the engineer's attention via RFI.
 - 2. All existing conditions must be clearly annotated on the As-Built drawings.
- H. Repair any walls, floors or roofs that piping, ducts or equipment have been removed from (or through). Patch with similar materials to match finish and color (paint to match). If paint cannot be matched, repaint entire wall or surface.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 220006

SECTION 220100**SPECIAL CONDITIONS FOR ALL PLUMBING WORK****PART 1- GENERAL****1.1 DESCRIPTION OF WORK**

- A. This section covers the general provisions of the plumbing specifications applicable to the following systems:
 - 1. Plumbing.
- B. The use of the word plumbing in the body of the various specifications sections shall be interpreted to include all the aspects of all of the systems referenced in the Plumbing Specifications.

1.2 DRAWINGS

- A. These specifications are accompanied by drawings of the building and details of the installations showing the locations of equipment, piping, etc. The drawings and these specifications are complementary to each other; requirements described in one or the other shall be considered binding as if described in both.
- B. If any departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Owner's Representative for approval. No departures shall be made without prior written approval by the Owner's Representative.
- C. There are intricacies of construction which are impractical to specify or indicate in detail; means and methods for performing such work shall adhere to commonly accepted industry standards.
- D. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Mechanical, Plumbing and Electrical drawings and applicable shop drawings where such information affects his work.
- E. For new buildings, all final dimensions shall be scaled from the drawings, unless otherwise noted. For work associated with existing buildings (renovations and additions), all final dimensions shall be field verified.

1.3 CONSTRUCTION REQUIREMENTS

- A. The architectural, civil, structural, mechanical, electrical, plumbing, and fire protection drawings, and specifications are all part of the Contract Documents. In many instances there are details described in another trade's drawings that are not necessarily included or referenced in the plumbing drawings. It is the Contractor's responsibility to review in detail all parts of the Contract Documents prior to submitting a bid. Failure to comply with this requirement shall not relieve the Contractor of responsibility or be used as cause for additional compensation because architectural, structural, or electrical details were not included in the plumbing drawings.
- B. It is the intent of the Contract Documents to provide complete and fully functional installation in every respect. Material and/or construction details not specifically described in the Contract Documents, but commonly considered incidental to the industry, are required by the Contractor.

- C. The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to comply with Codes, to facilitate the work of other trades, to conform to the details of the installation supplied by the manufacturer of the equipment to be installed, and thereby to provide an integrated satisfactory operating installation.
- D. The plumbing, electrical and mechanical drawings are schematic in nature and do not show every connection in detail or every pipe or conduit in its exact location. These details are subject to the requirements of ordinances and structural and architectural conditions.
- E. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and above suspended ceilings, etc. in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid compromising structural members; therefore, inserts to accommodate hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc. shall be provided as hereinafter specified or as otherwise indicated or required. All work shall be installed parallel or perpendicular to building lines unless otherwise noted.
- F. When the plumbing drawings do not give exact details as to the elevation of pipe or equipment, physically arrange the systems to fit in the space available at the elevations intended with the proper grades for the functioning of the system involved. Piping and exposed conduit, are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The plans do not show all required offsets, control lines, pilot lines, and other location details. Work shall be concealed in all finished areas. Piping specified to be insulated shall be supported in a manner that will allow the insulation to be installed without gaps. Insulated piping in concealed areas shall be offset with fittings as necessary to permit installation of insulation. Bending of pipes or installing pipes in a strain to insulate will not be permitted.
- G. Final placement of serviceable equipment shall be carefully coordinated with all other trades to ensure sufficient clearance for maintenance according to manufacturer's recommendations. Lubricating orifices and adjustable components shall be easily accessible. Piping, conduit, valve stems, cabling and other building systems shall not interfere with service space.
- H. Location of Exposed Devices
 - 1. All exposed devices (sprinkler heads, medical gas outlets, plumbing rough-ins, lights, outlets, communication devices, etcetera) shall be referenced to fixed data points that are coordinated with all trades; shall be located to present symmetrical arrangements with respect to the fixed data point; and shall facilitate the proper arrangements of acoustical ceiling tiles. Fixed data points shall include such features as wall and ceiling lines, soffits, balanced border widths, masonry joints, etc. Devices located in acoustical ceiling tiles shall occur symmetrically in tile joints or in the centers of whole tiles. The final determination of the exact location of each outlet and the arrangements to be followed shall be acceptable to the Owner's Representative.
 - 2. The drawings schematically indicate locations of the exposed devices. Final locations shall be determined by carefully coordinating the drawings pertaining to each trade. Where conflicts are identified, Owner's Representative shall determine final location. The Owner reserves the right to make any reasonable change in location of any device before installation, without additional cost to the Owner or the Architect.

1.4 QUALIFICATIONS

- A. Contractor must have minimum of five years experience installing commercial, plumbing and piping systems similar to those described in these Contract Documents.
- B. Contractor must be licensed and hold a current contracting license that has been valid for a minimum of five years in the State of Texas.
- C. Contractor must be able to bond work for payment and performance of work being bid. Contractor's bonding agency shall have a Best's insurance rating of A or A+.

1.5 MATERIAL AND EQUIPMENT REQUIREMENTS

- A. **Manufacturer's Instructions:** The manufacturer's published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufacturer materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Owner's Representative in writing of any conflict between the requirements of the Contract Documents and the manufacturer's direction and shall obtain the clarification of the Owner's Representative before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such clarification by the Owner's Representative, he shall bear all costs arising in connection with the correction of the deficiencies.
- B. **Storage at Site:** The Contractor shall not receive material or equipment at the jobsite until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage and from surrounding work.
- C. **Capacities** shall be not less than those indicated and shall be such that no component or system becomes inoperative or is damaged because of startup or other overload conditions.
- D. **Conformance to Agency Requirements:** Where materials or equipment are specified to be approved, listed, tested, or labeled by the Underwriters Laboratories, Inc., or constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of Underwriters Laboratories, Inc. applied to the item will be acceptable as sufficient evidence that the items conform to such requirements. The ASME stamp or the AMCA label will be acceptable as sufficient evidence that the items conform to the respective requirements.
- E. **Nameplates:** Each major component of equipment shall have the manufacturer's name, address, and model-identification number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Inspection.
- F. **Prevention of Rust:** Standard factory finish will be acceptable on equipment specified by model number; otherwise surfaces of ferrous metal shall be given a rust-inhibiting coating. The treatment shall withstand 200 hours in salt-spray fog test, in accordance with Method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking and no signs of rust creepage beyond 1/8 inch on either side of the scratch mark. Where rust inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable unless a specific coating is specified, except that coal tar or asphalt-type coatings will not be acceptable unless so stated for a specific item. Where steel is specified to be hot-dip galvanized, mill-galvanized sheet steel may be used provided all raw edges are painted with a zinc-pigmented paint conforming to Military Specification MIL-P-26915.
- G. **Protection from Moving Parts:** Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.

- H. Drive Guards: For machinery and equipment, provide guards as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears, and other moving parts regardless of height above the floor. Drive guards may be excluded where motors and drives are inside factory-fabricated air handling units casings. Guards shall be constructed of sheet steel, cast iron, expanded metal, or wire mesh rigidly secured so as to be removable without disassembling pipe duct or electrical connection to equipment. Provide a 1-inch diameter hole in each drive guard at each shaft center to allow access for speed measurement.
- I. Verifications of Dimensions: The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Owner's Representative of any discrepancy before performing any work. Adjustments to the work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner, Architect, or Engineer.
- J. Standard Products: Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.
- K. Spare Parts Data: As soon as practicable after approval of materials and equipment and, if possible, not later than four months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies with current unit prices and sources of supply, a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified hereinafter to be furnished as part of the Contract, and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days at the particular installation. The foregoing shall not relieve the Contractor of any responsibilities under the warranty specified.

1.6 INSPECTION OF THE SITE

- A. The Contractor shall visit the site, verifying all existing items indicated on drawings and/or specified, and familiarize himself with the existing work conditions, hazards, grades, actual formations, soil conditions, structures, utilities, equipment, systems, facilities, and local requirements. The submission of bids shall be deemed evidence of such visits. All proposals shall take these existing conditions into consideration, and the lack of specific information shall not relieve the Contractor of any responsibility.

1.7 UTILITY LOCATIONS AND ELEVATIONS

- A. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered separately from the Contract Documents, as a general guide only, without guarantee as to accuracy. Examine the site, the locations, and availability of all utilities and services required for their relation to the work. Verify the location of all existing site utilities with each responsible utility company or applicable party. The Contractor shall repair all damage to existing utilities, whether indicated on the drawings or not, at his sole expense.

1.8 PERMITS, UTILITY CONNECTIONS, AND INSPECTIONS

- A. Permitting Fees: Contractor shall pay for all fees associated with permits required by municipal authorities having jurisdiction.
- B. Tapping and Impact Fees: Contractor shall pay for all fees associated with tapping into municipal utility mains, including sanitary sewer, natural gas and domestic water. Impact fees will be paid for by the Owner.
- C. Compliance: The Contractor shall comply in every respect with all requirements of local authorities having jurisdiction, including building inspections, fire marshal, local ordinances and codes, and utility company requirements. In no case does this relieve the Contractor of the responsibility of complying with these specifications and drawings where specified conditions are of a higher quality than the requirements of the above-specified authorities. Where requirements of the specifications and drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above authorities.
- D. Utilities: The Contractor shall coordinate with the various utility companies involved in this project and shall provide required utility relocations, extensions, modifications, and/or changes (complete in all respects) as described in the Contract Documents. Contractor shall verify the location of all existing utilities with the applicable Utility Company. The Contractor shall be responsible for all damages to existing utilities, whether indicated on drawings or not, and repair all damage to existing utilities as acceptable to the affected Utility Company.
- E. Certification: Prior to final acceptance, the Contractor shall furnish a certificate of acceptance from the inspection departments having jurisdiction over the work for any and all work installed under this Contract. Any additional labor costs incurred as a result of a substitution shall be the Contractor's responsibility.

1.9 EXISTING FACILITIES

- A. The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection, and in-service maintenance of all plumbing, heating, air conditioning, and ventilating services for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.
- B. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being performed under this project.
- C. Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc. to provide this access and shall reinstall same upon completion of work in the areas affected.
- D. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, all Contractors shall remove and reinstall in locations approved by the Architect/Engineer all devices required for the operation of the various systems installed in the existing construction. This is to include but is not limited to temperature controls system devices, electrical switches, relays, fixtures, piping, conduit, etc.

- E. Outages of services as required by the new installation will be permitted but only at a time approved by the Owner. The Contractor shall allow the Owner two weeks in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

1.10 DEMOLITION AND RELOCATION

- A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner and shall be delivered to such destination or otherwise disposed of as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.
- B. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.
- C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the Contractor's responsibility and shall be repaired or replaced by the Contractor as approved by the Owner, at no additional cost to the Owner.
- D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as hereinbefore specified.

1.11 SUBSTITUTION OF MATERIALS AND EQUIPMENT

- A. No substitution of materials or equipment herein specified or called for on the drawings will be permitted, except by written permission of the Owner's Representative. Where several makes of equipment or material are mentioned, any item named may be bid upon provided it meets space, capacity specifications, and other requirements.

1.12 SUBMITTALS

- A. Submittals for Review:
 - 1. As soon as practical or within 30 days after the date of contract award or notice to proceed, and before purchasing or starting installation of any materials or equipment, the

Contractor shall submit for review sufficient material and equipment data to indicate that all requirements of the specifications have been met and samples shall be furnished when requested. All manufacturer's data used as part of the submittal shall have all non-applicable features crossed out or deleted in a manner that will clearly indicate exactly what is to be furnished.

2. Four (4) copies of the submittal list and detailed submittals (for the Owner's and A/E's use) shall be submitted to the Owner's Representative. The Contractor is requested to include a minimum of three (3) additional copies for insertion in the project's Owner's Manuals at the completion of the project, and the number of additional copies the Contractor requires for his and his subcontractor's use during the project's construction. The detailed submittals shall be accompanied by the same number of sets of pictorial and descriptive data derived from the manufacturer's catalogs and sales literature or incorporated in the shop drawings. The Contractor may provide a detailed submittal on any item even though not required by the Owner's Representative.

B. Format

1. Submittals shall be in pdf format. The first page shall have a cover sheet inserted with the title "PLUMBING SUBMITTALS" centered in large print. Below the title shall be printed the name of the project, the date, the project location, the name and address of the contractor, the name and address of the subcontractor and the name and address of the engineer(s) in smaller print.
2. Provide a Table of Contents at the beginning of the binder that summarizes the information being submitted according to specification section.
3. Submittals shall be tab divided by specification section; **all sections** identified in the project specifications shall have a tab. When no information is being provided concerning a particular specification section, insert a single dated sheet that explains the circumstances.
4. **Loose-leaf or piecemeal submittals are not acceptable and subject to rejection unless prior approval has been granted by the Engineer.**

C. Content:

1. The Contractor shall prepare or cause to be prepared shop drawings, product data, materials and equipment lists, diagrams, data, samples, and other submittals as required by the contract documents, hereinafter referred to as "Submittal Data." The Contractor shall review and approve all submittal data for compliance with the contract documents, manufacturer's recommendations, adequacy, clearances, code compliance, safety, and coordination with associated work.
2. The Contractor shall submit approved submittal data to the Owner's Representative for review and comment as to general conformance with the design concept and general compliance with information given in the contract documents. Owner's Representative's review shall not include review of quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with other trades or work, or construction safety and precautions, all of which are the sole responsibility of the Contractor.
3. The Contractor shall clearly and specifically identify and call to the attention of the Owner's Representative any deviation from the contract documents for which Owner acceptance is desired. The responsibility for such a deviation accepted by the Owner shall remain with the Contractor.
4. **Timeliness:** The burden of timeliness in the complete cycle of submittal data is on the Contractor. The Contractor shall allow a minimum of two (2) weeks' time frame for review of each submission by the Owner's Representative. The Contractor is responsible for allowing sufficient time in the construction schedule to cover the aforementioned cycles of data processing, including time for all re-submission cycles on nonconforming materials, equipment, etc. covered by the data submitted. Construction delays and/or lack of

timeliness in the above regard are the responsibility of the Contractor and will not justify any request for scheduled construction time extensions or extra compensation.

5. Work performed in accordance with approved submittal date that is not in accordance with the Contract Documents and did not have the specific acceptance of the Owner's Representative shall be replaced at Contractor's cost.

D. Re-submittals

1. Re-submit entire submittal in accordance with afore mentioned format and content requirements. **Loose-leaf or piecemeal re-submittals are not acceptable.** New and/or revised data for each section shall be prefaced with a colored (yellow, pink, orange, etc) cover sheet that identifies (in a word or two) the materials and/or equipment being re-submitted. Typeset the words "REVISED SUBMITTAL NO. 1 (or 2, 3 as applicable)" centered at the bottom of the cover sheet.
2. Subsequent re-submittals (second and third, if necessary) shall have different colored cover sheets to distinguish between the various re-submittals.
3. Include a cover letter at front of binder that specifically responds to each "REVISE AND RE-SUBMIT COMMENT" or "REJECTED" comment by number. Example responses would include the following:
 - a. RESPONSE: "Please see attached re-submittal."
 - b. RESPONSE: "Will be re-submitted at a later date."
 - c. RESPONSE: "Requirement for (xxxxxx) was deleted in Addendum No. 2."
 - d. RESPONSE: "Exception requested based on Section xx, Paragraph x.x.x."

- E. These paragraphs related to Plumbing submittal data supersede any conflicting requirements contained in Division 01 sections.

1.13 CONTRACTOR CERTIFICATION OF SUBMITTAL DATA

- A. The Contractor shall provide the following certification with all submittal data furnished to the Owner's Representative for review and comment.

Project Title:

Description of Submittal Data:

This is to certify that the above-described submittal data has been reviewed and is approved for compliance with the Contract Documents, manufacturer's recommendation, adequacy, clearances, code compliance, safety, and coordination with other trades and/or work except as follows: (list "none" or itemize and explain). In addition, the Contractor shall submit to the Owner's Representative a signed statement from each representative certifying as follows:

"I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer's representative and is properly installed and operating in accordance with the manufacturer's recommendations and are asbestos free."

Name and Company

1.14 ACCEPTANCE OF MATERIALS AND EQUIPMENT

- A. All equipment installed on this project shall have **local (within 125 miles)** representation, local factory-authorized service, and a local stock of repair parts. This requirement is essential and will be strictly reviewed by the Owner's Representative prior to concurrence with the Contractor's approval for all submittals covered by Plumbing Division of this Specification.
- B. NOTICE: The Contractor is responsible for providing materials and equipment that conform to the requirements of the project manual in every respect unless a deviation has been "accepted" in writing. Removal of any nonconforming materials and equipment and the replacement with conforming materials and equipment shall be at the Contractor's sole expense, regardless of when nonconformance was discovered.
- C. Approval of materials and equipment shall be based on manufacturer's published data and shall be tentatively subject to the submission of complete shop drawings which comply with the contract documents. Approval is also dependent upon the existence of adequate and acceptable clearances for entry, servicing, and maintenance.
- D. Approval of materials and equipment under this provision shall not be construed as authorizing any deviations from the specifications, unless the attention of the Owner's Representative has been directed in writing to the specific deviations. Data submitted shall not contain unrelated information unless all pertinent information is properly identified.
- E. Physical Size of Equipment: Space is critical; therefore, equipment of larger sizes than shown, even though of approved manufacturer, will not be acceptable unless it can be demonstrated that ample space exists for proper installation, operation, and maintenance.

1.15 SITE OBSERVATION

- A. Site observation by the Architect, Engineer, and/or Owner's Representative is for the express purpose of verifying compliance by the Contractor with the contract documents, and shall not be construed as construction supervision nor indication of approval of the manner or location in which the work is being performed as being a safe practice or place.

1.16 SUPERVISION

- A. In addition to the Superintendent required under the conditions of the contract, each subcontractor shall keep a competent superintendent or foreman on the job at all times.
- B. It shall be the responsibility of each superintendent to study all plans and familiarize himself with the work to be done by other trades. He shall coordinate his work with other trades and, before material is fabricated or installed, make sure that his work will not cause an interference with another trade. Where interferences are encountered, they shall be resolved at the jobsite by the superintendents involved. Where interferences cannot be resolved without major changes to the plans, the matter shall be referred to the Owner's Representative for comments.

1.17 OPERATION PRIOR TO COMPLETION

- A. When any piece of equipment is operable and it is to the advantage of the Contractor to operate the equipment, he may do so, providing that he properly supervises the operation and has the written permission of the Owner's Representative to do so. The warranty period shall not commence, however, until such time as the equipment is operated for the beneficial use of the Owner or date of substantial completion, whichever occurs first.

- B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust, and complete all deficiency list items before final acceptance by the Owner. The date of acceptance and the start of the warranty may not be the same date.

1.18 MANUFACTURER'S RECOMMENDATIONS

- A. The manufacturer's published directions shall be followed in the delivery, storage, protection, installation, piping, and wiring of all equipment and material. The Contractor shall promptly notify the Owner's Representative, in writing, of any conflict between the requirements of the contract documents and the manufacturer's directions and shall obtain the Owner's Representative's comments before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or applicable comments from the Owner's Representative, he shall bear all costs arising in connection with the correction of such deficiencies.

1.19 CHECKING AND TESTING MATERIALS AND/OR EQUIPMENT

- A. Before final acceptance of the work, an authorized representative of the manufacturer of the installed materials and/or equipment shall personally inspect the installation and operation of his materials and/or equipment to determine that it is properly installed and in proper operating order. Testing and checking shall be accomplished during the course of the work where required by work being concealed, and at the completion of the work otherwise. In addition, the Contractor shall submit to the Owner's Representative a signed statement from each representative certifying as follows:

"I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer's representative and is properly installed and operating in accordance with the manufacturer's recommendations and are asbestos free."

- B. Check inspections shall include plumbing, heating, air conditioning, ventilating, mechanical control and electrical equipment, and such other items hereinafter specified or specifically designated by the Owner's Representative.

1.20 OPERATING AND MAINTENANCE INSTRUCTION

- A. The Contractor shall prepare for the owner's manual hereinafter specified complete sets of operating and maintenance instructions, system piping, valving, control and interlock diagrams, manuals, parts lists, etc. for each item of equipment. These are to be assembled as hereinafter specified for owner's manual.
- B. In addition, the Contractor shall provide the service of a competent engineer or a technician acceptable to the Owner's Representative to instruct a representative of the Owner in the complete and detailed operation of all equipment and systems. These instructions shall be provided for a period of sufficient duration to fully accomplish the desired results. Upon completion of these instructions, a letter of release will be required, acknowledged by the Owner, stating the dates of instruction and personnel to whom instructions were given.
- C. Additional diagrams, operating instructions, etc. shall be provided as specified hereinafter in the other sections of these specifications.

1.21 MATERIAL AND EQUIPMENT SCHEDULES

- A. Contractor shall refer to both drawings and specification for schedules. Where reference is made to items "scheduled on drawings" or "scheduled in specifications," same shall include schedules contained in both the drawings and the specifications. The Contractor's attention is directed to the various specification sections and drawings for schedules.

1.22 APPLICABLE CODES AND STANDARDS

- A. The installation shall meet the minimum standards prescribed in the latest editions of the following listed codes and standards, which are made a part of these specifications, except as may be hereinafter specifically modified in these specifications and associated drawings.
1. National Fire Protection Association Standards (NFPA):
 - NFPA 10 - Portable Fire Extinguishers
 - NFPA 54 - National Fuel and Gas Code
 - NFPA 70 - National Electrical Code
 - NFPA 90A - Air Conditioning Systems
 - NFPA 101 - Life Safety Code
 - NFPA 255 - Method of Test of Surface Burning Characteristics of Building Materials
 2. American National Standards Institute (ANSI):
 - 15-78 - Safety Code for Mechanical Refrigeration
 - C.2 - 1984 National Electrical Safety Code
 - A117.1 - Handicapped Code
 3. American Society of Mechanical Engineers (ASME): Section IV, V, CSD-1
 4. Air Conditioning and Refrigeration Institute Standards (ARI): All standards related to refrigeration and air conditioning equipment and piping furnished under these specifications.
 5. American Water Works Association (AWWA): All applicable manuals and standards.
 6. Sheet Metal and Air Conditioning Contractors National Associate, Inc, (SMACNA): All applicable manuals and standards.
 7. Air Moving and Conditioning Association (AMCA): All applicable manuals and standards.
 8. American Society of Testing Materials (ASTM): All applicable manuals and standards.
 9. National Electrical Manufacturers' Association (NEMA): All applicable manuals and standards.
 10. Occupational Safety and Health ACT (OSHA):
 - National Sanitation Foundation - Standard No. 2
 11. American Society of Heating, Refrigeration, and Air conditioning Engineers (ASHRAE):
 - 90-80 Energy Conservation in New Building Design
 - 2001 ASHRAE Handbook of Fundamentals
 12. Americans with Disabilities Act, 1990
 13. American Gas Association (AGA)
 14. Underwriters Laboratories, Inc. (UL)
 15. Manufacturer's Standardization Society of the Valve and Fitting Industry (MSS)
 16. Applicable State Building Codes (International Building Codes, as amended):
 17. Applicable State Mechanical Code (International Mechanical Code, as amended).
 18. Applicable State Plumbing Code (International Plumbing Code, as amended).
 19. Applicable State Energy Code (International Energy Conservation Code, as amended).
- B. All materials and workmanship shall comply with all applicable city, state, and national codes, specifications, and industry standards. All materials shall be listed by the Underwriters Laboratories, Inc. as conforming to its standards and so labeled in every case where such a standard has been established for the particular type of material in question.

- C. The contract documents are intended to comply with the aforementioned rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the Contractor shall immediately notify the Owner's Representative in writing of said discrepancies and apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with said regulations shall be paid for as covered by Division 1 of these contract documents, providing no work or fabrication of materials has been accomplished in a manner of noncompliance. Should the Contractor fabricate and/or install materials and/or workmanship in such a manner that does not comply with the applicable codes, rules, and regulations, the Contractor who performed such work shall bear all costs arising in correcting these deficiencies to comply with said rules and regulations.

1.23 DEFINITIONS

- A. Refer to the condition of the contract for Division 1 for additional requirements regarding definitions.
- B. Where "as required" or "as necessary" is used in these specifications or on the drawings, it shall mean "that situations exist that are not necessarily described in detail or indicated that may cause the Contractor certain complications in performing the work described or indicated. These complications entail the normal coordination activities expected of the Contractor where multiple trades are involved and new or existing construction causes deviations to otherwise simplistic approaches to the work to be performed. The term shall not be interpreted to permit an option on the part of the Contractor to achieve the end result."
- C. Where "and/or" is used in these specifications or on the drawings, it shall mean "that situations exist where either one or both conditions occur or are required and shall not be interpreted to permit an option on the part of the Contractor."

1.24 FINAL INSPECTION

- A. Refer to Division 1 for additional requirements for final inspection.
- B. It shall be the responsibility of the Contractor to personally conduct a careful inspection, assuring himself that the work on the project is ready for final acceptance and developing his own "punchlists," before calling upon the Owner's Representative to make a final inspection. Failure of the Contractor to conduct such inspections and provide the Owner's Representative with a copy of his "punchlists" prior to the final inspection shall be adequate cause for the Owner's Representative to cancel any Contractor-requested final inspection.
- C. In order not to delay final acceptance of the work, the Contractor shall conduct his own "final inspections" prior to requesting the Owner's Representative to "final" the project; will have all necessary bonds, guarantees, receipts, affidavits, etc. called for in the various articles of this specification prepared and signed in advance; and together with a letter of transmittal listing each paper included, shall deliver the same to the Owner's Representative at or before the time of said final inspection. The Contractor is cautioned to check over each bond, receipt, etc. before preparing same for submission to see that the terms check with the requirements of the specifications.
- D. The final inspection will be made jointly by the Owner's Representative and the Owner.

1.25 REQUIREMENTS FOR FINAL ACCEPTANCE

- A. Requirements for final acceptance shall include but not be limited to the Contractor accomplishing the following:
1. Construction: Complete all construction.
 2. Deficiency Lists: Correct all deficiencies listed at time of Substantial Completion.
 - a. Owner's Manual: Submit at least 30 days prior to final acceptance on (1) copy of the owner's manual for the Owner's Representative's review and comments. Following acceptance, prepare three (3) copies of bound and indexed owner's manual, to be delivered System operating instructions.
 - b. System control drawings.
 - c. System interlock drawings.
 - d. System maintenance instructions.
 - e. Manufacturers', suppliers', and subcontractors' names, addresses, and telephone numbers, both local representatives and manufacturers' service headquarters.
 - f. Equipment operating and maintenance instructions and parts lists.
 - g. Manufacturer's' certifications (see Checking and Testing Materials and/or Equipment, this section).
 - h. Contractor's warranty.
 - i. Acceptance certificates of authorities having jurisdiction.
 - j. Log of all tests made during course of work.
 - k. Owner's acknowledgment of receipt of instruction, enumerating items in owner's manual.
 - l. List of manufacturers' guarantees executed by the Contractor.
 - m. Certified performance curves.
 - n. Balance and performance test reports.
 - o. Owner's acknowledgment of items of equipment or accessories indicated or specified to be turned over to Owner.
 - p. Verbal, as herein specified.
 - q. Posted, framed under glass or plastic laminated:
 3. At the time of final acceptance, which shall include but not be limited to the following:
 4. Instructions:
 - a. System operating instructions.
 - b. System control drawings.
 - c. System interlock drawings.
 5. Record Drawings: Deliver the specified record drawings to the Owner's Representative.

1.26 RECORD DRAWINGS

- A. The Contractor shall maintain a set of contract drawings (black-line prints) at the jobsite on which he shall indicate the installed (as-built) locations of the following:
1. Equipment
 2. Main lines of piping and ductwork.
 3. Dimensional locations (including depth) of all underground piping, valves and conduits.
- B. Drawings shall be used for construction reference and shall not leave the field office of the jobsite.
- C. Drawings shall include all addenda, ASI's, Change Orders, and existing conditions and equipment that are not reflected in the original contract drawings.
- D. Upon completion of work, the Contractor shall obtain CAD files of the contract drawings from the Owner's Representative and transfer the above as-built information into these files. The as-built files shall be permanently marked "RECORD DRAWINGS" and printed on full-size Mylar sheets. Upon completion, the CAD files shall be transferred to CD in AutoCAD 2007 format. Both the

CAD files CD and Mylar drawings shall be submitted to the Owner's Representative as part of the Close-out Submittals.

- E. Refer to Division 1 paragraph entitled "Record Documents" for additional requirements.

1.27 ALLOWANCES

- A. Refer to Division 1 for allowances.

1.28 ALTERNATE PROPOSALS

- A. Alternate proposals are summarized in Division 1 and on the bid proposal form. Refer to all sections of the specifications and the drawings to determine the exact extent and scope of the various alternate proposals as each pertains to the work of the various trades.

1.29 WARRANTY

- A. General: All work performed (including equipment and materials furnished) under the various sections of these specifications shall be 100% warranted, for a period of one (1) year from the date of final acceptance thereof, against defective materials, design, and unauthorized substitution. Upon receipt of note of failure of any part of the guaranteed equipment and/or facilities during the warranty period, the affected part(s) or facilities shall be replaced promptly with new parts, etc. by and at the expense of the Contractor. Further, the Contractor shall properly obtain, execute, and forward any and all manufacturer's warranties on equipment furnished under the Contract. Refer to Division 1 for additional requirements.
- B. Extended Period: The Contractor shall provide all extended time warranties available from the manufacturer of the equipment provided as standard at no additional cost. This includes all extended warranties where specified with certain equipment as directed in other sections of this Specification.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

- A. **All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner's Representative prior to bidding may be furnished.**
- B. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.
- C. The responsibility for the furnishing and installation of the proper plumbing equipment and/or material as intended rests entirely upon the Contractor. The Contractor shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

2.2 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS

- A. Duct coverings, duct linings, vapor barrier facings, tapes, adhesives, core materials, insulation, jackets, piping (of any sort), and other materials in concealed locations, including any above-ceiling area, shall have a flame spread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating no higher than 50. Flame spread and smoke developed ratings shall be in accordance with NFPA Standard No. 255.

2.3 BEARINGS

- A. All ball bearings shall be of radial and/or thrust type and enclosed in a dust and moisture-proof housing.

2.4 MOTORS

- A. The Contractor shall provide all motors required for equipment supplied under each portion of the work. Motors shall be built in accordance with the latest ANSI, IEE, and NEMA standards, shall be fully coordinated with the equipment served, shall be of sizes and electrical characteristics scheduled.

2.5 STARTING EQUIPMENT

- A. Each motor shall be provided with proper starting equipment. This equipment, unless hereinafter specified or scheduled to the contrary, shall be provided by the trade furnishing the motor. All motor starting equipment provided by any one trade shall be of the same manufacture unless such starting equipment is an integral part of the equipment on which the motor is mounted.

2.6 FIRE AND SMOKE PARTITION, WALL, AND/OR FLOOR PENETRATIONS

- A. Pipe, ductwork, conduit, etc. shall pass through fire- or smoke-rated floors, partitions, walls, or other barriers within a UL-listed assembly which shall maintain the rating of the applicable wall, floor, partition, or barrier.
- B. The Contractor shall review the architectural and structural drawings and determine the location of the fire-rated building elements. Where these elements are penetrated, UL-listed fire-rated penetration assemblies approved by the local authority shall be provided in accordance with the manufacturer's instructions to obtain the required rating.

2.7 FOUNDATIONS / HOUSEKEEPING PADS

- A. General: All special foundations and supports required for the proper installation of equipment and pipe shall be provided as hereinafter specified and under the section of the specifications covering the equipment, unless otherwise indicated on the drawings.
- B. All equipment shall receive concrete housekeeping pads unless otherwise noted. Equipment to be receive pads are to include (but not limited to): boilers, water heaters, water softeners, expansion / compression tanks, filter feeders, water treatment equipment, air compressors, pumps (in addition to inertia bases where required), surge tanks, deareators, etc.
- C. Concrete foundations for the support of equipment such as floor-mounted pumps, equipment, etc. shall be not less than 3 inches high and not less than 4 inches larger (in both directions) than supported unit, unless otherwise noted and shall be poured in forms built of new dressed lumber. All corners of the foundations shall be neatly chaffered by means of sheet metal or triangular

wood strips nailed to the form. Pads shall not be laid out directly against walls or structures. 2 inches shall be left available for pad form work. Foundation bolts shall be placed in the forms when the concrete is poured, the bolts being correctly located by means of templates. Allow 1 inch below the equipment bases for alignment and grouting (where applicable). Foundations for equipment located on the exterior of the building shall be provided as indicated. Foundations shall be constructed in accordance with approved shop drawings and shall be reinforced with #4 bars at 12 inches on center both ways (minimum).

- D. Pipe and Conduit Support: All pipes and conduits throughout the building, both horizontal and vertical, shall be adequately supported from the construction to line of grade, with proper provision for expansion, contraction, vibration elimination, and anchorage. Vertical pipes and conduits shall be supported from floor lines with riser clamps sized to fit the lines and to adequately support their weight. At the bases of lines, where required for proper support, provide anchor base fittings or other approved supports.

PART 3 - EXECUTION

3.1 SPACE AND EQUIPMENT ARRANGEMENT

- A. The size of equipment indicated on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers will be acceptable, it is the responsibility of the Contractor to determine whether the equipment he proposes to furnish will fit in the space. Shop drawings shall be prepared when required by the Owner's Representative to indicate a suitable arrangement.
- B. All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.

3.2 LARGE APPARATUS

- A. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly, completely protected from damage as hereinafter specified.

3.3 PROTECTION

- A. The Contractor shall take such precautions as may be necessary to properly protect all materials and equipment from damage from the time of delivery until the completion of work. This shall include the erection of all required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work; the cribbing of any items above the floor of the construction; and the covering of items in the uncompleted building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.
- B. The Contractor shall protect existing facilities, the work of others, and the premises from any and all damages that may be made possible by the execution of work.

- C. Equipment and materials shall be protected from rust both before and after installation. Any equipment or materials found in a rusty condition at the time of final inspection must be cleaned of rust and repainted as specified elsewhere in these specifications.

3.4 COOPERATION BETWEEN TRADES AND WITH OTHER CONTRACTORS

- A. Each trade, subcontractor, and/or Contractor must work in harmony with the various trades, subcontractors, and/or Contractors on the job as may be required to facilitate the progress to the best advantage of the job as a whole. Each trade, subcontractor, and/or Contractor must pursue its work promptly and carefully so as not to delay the general progress of the job. This Contractor shall work in harmony with Contractors working under other contracts on the premises.
- B. It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the jobsite in a clean and safe condition. At the end of each day's work, each trade shall properly store all of its tools, equipment, and materials and shall clean its debris from the job. Upon the completion of the job, each trade shall immediately remove all of its tools, equipment, any surplus materials, and all debris caused by its portion of the work.

3.5 PRECEDENCE OF MATERIALS AND COORINATION OF WORK

- A. These specifications and the accompanying drawings are intended to cover systems which will not interfere with the structural design of the building, which will fit into the several available spaces, and which will ensure complete and satisfactory systems. Each subcontractor and/or trade shall be responsible for the proper fitting of his material and apparatus into the building.
- B. The work of the various trades shall be performed in the most direct and workmanlike manner without hindering or handicapping the work of other trades. Piping interferences shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. Where space requirements conflict, the following order or precedence shall, in general, be observed:
 - 1. Building lines.
 - 2. Structural members.
 - 3. Light fixtures.
 - 4. Soil and drain piping.
 - 5. Condensate drains.
 - 6. Vent piping.
 - 7. Supply, return, and outside air ductwork.
 - 8. Exhaust ductwork.
 - 9. HVAC water and steam piping.
 - 10. Steam condensate piping.
 - 11. Fire protection piping.
 - 12. Natural gas piping.
 - 13. Domestic water (cold and hot).
 - 14. Refrigerant piping.
 - 15. Electrical conduit.
- C. Coordinate all major elements, components, and systems of plumbing equipment and materials in relationship with other systems, installations, and building components. Coordinate space requirements for installation and access. Verify the following:
 - 1. Clearance for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 - 2. Equipment and accessory service connections and support details.
 - 3. Fire-rated wall and floor penetrations.

4. Scheduling, sequencing, movement and positioning of large equipment into building during construction.
 5. Access panel and door locations.
 6. Clearances between building openings and VTR's/Flues.
- D. The light fixture grid layout as indicated on the drawings must be maintained. This Contractor shall refer to all light fixture plans and details indicated on the drawings and shall coordinate the location of dampers, supply grilles, return air grilles, sprinkler heads, etc. with the location of the light fixtures to assure proper access to all items in a manner acceptable to the Owner's Representative.
- E. The electrical trades shall locate all junction boxes, pull boxes, conduits, etc. to avoid interference with the diffusers, dampers, grilles, etc. hereinbefore mentioned. The mechanical trades shall furnish to all other trades copies of approved ductwork shop drawings to assist in the coordination of the rough-in and installation of all items of work.

3.6 CONNECTIONS FOR OTHERS

- A. This Contractor shall rough-in for and make all water, sewer, electrical, etc. connections to all fixtures, equipment, machinery, etc. provided by others in accordance with detailed roughing-in drawings provided by the equipment suppliers, by actual measurements of the equipment connections, or as detailed.
- B. After the equipment is set in place, this Contractor shall make all final connections and shall provide all required pipe, fittings, valves, traps, connectors, etc.
- C. Provide all air gap fittings required, using materials hereinbefore specified. In each water line serving an item of equipment or piece of machinery, provide a shutoff valve. On each drain without integral trap provide a suitable trap.
- D. All pipe fittings, valves, traps, etc. exposed in finished areas and connected to chrome-plated lines provided by others shall be chrome-plated to match.
- E. Provide all transition pieces, etc. required for a complete installation of equipment provided by others.

3.7 INSTALLATION METHODS

- A. Where to Conceal: All pipes and conduits shall be concealed in pipe chases, walls, furred spaces, below suspended floors, or above the ceilings of the building unless otherwise indicated.
- B. Where to Expose: In mechanical rooms, janitor's' closets tight against pan soffits in exposed Tee structures, or storage spaces, but only where necessary, piping and conduit may be run exposed. All exposed piping and conduit shall be run in the neatest, most inconspicuous manner, and parallel or perpendicular to the building lines.
- C. Support: All piping and conduit shall be adequately and properly supported from the building structure by means of hanger rods or clamps to walls as herein specified.
- D. Maintaining Clearance: Where limited space is available above the ceilings and below concrete beams or other deep projections, pipe and conduit shall be sleeved through the projection where it crosses, rather than hung below them, in a manner to provide maximum above-floor clearance. Sleeves shall be as herein specified. Approval shall be obtained from the Owner's Representative for each penetration.

- E. All pipe, conduits, etc. shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes, and conduits run exposed in machinery and equipment rooms shall be installed parallel to the building lines, except that they shall be sloped to obtain the proper pitch. Piping and ducts run in furred ceilings, etc. shall be similarly installed, except as otherwise shown. Conduits in furred ceilings and in other concealed spaces may be run at angles to the construction but shall be neatly grouped and racked indicating good workmanship. All conduit and pipe openings shall be kept closed until the systems are closed with final connections.
- F. Special Requirements:
1. There shall be no pipe joints nearer than 12 inches to a wall, ceiling, or floor penetration unless pipe joint is a welded or mechanically-coupled-type joint.
 2. The Contractor shall study all construction documents and carefully lay out all work in advance of fabrication and erection in order to meet the requirements of the extremely limited spaces. Where conflicts occur, the Contractor shall meet with all involved trades and the Owner's Representative and resolve the conflict prior to erection of any work in the area involved.
 3. Prior to the installation of any ceiling material, gypsum, plaster, or acoustical board, the Contractor shall notify the Owner's Representative so that arrangements can be made for an inspection of the above-ceiling area about to be "sealed off." The Contractor shall give as much advance notice as possible up to ten (10) working days, but in no case less than five (5) working days.
 4. The purpose of this inspection is to verify the completeness and quality of the installation of the air conditioning systems, the plumbing systems, and any other special above-ceiling systems such as pneumatic tube. The ceiling supports (tee bar or lath) should be in place so that access panel and light fixture locations are identifiable and so that clearances and access provisions may be evaluated.
 5. No ceiling material shall be installed until the deficiencies listed from this inspection have been corrected to the satisfaction of the Owner's Representative.

3.8 CUTTING AND PATCHING

- A. General: Cut and patch walls, floors, etc. resulting from work in existing construction or where made necessary by failure to provide proper openings or recesses in new construction.
- B. Methods of Cutting: Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Owner's Representative. Impact-type equipment will not be used except where specifically acceptable to the Owner's Representative. Openings in concrete for pipes, conduits, outlet boxes, etc. shall be core drilled to exact size. **Determine location of embedded conduit and reinforcing bars prior to cutting.**
- C. Restoration: All openings shall be restored to "as-new" condition under the appropriate specification section for the materials involved, and shall match remaining surrounding materials and/or finishes.
- D. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc. shall be of the proper size and shape, and shall be installed in a manner acceptable to the Owner's Representative.

- E. Plaster: All plumbing work in area containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
- F. Weakening: No cutting, boring, or excavating which will weaken the structure shall be undertaken.

3.9 ROOF PENETRATIONS AND FLASHING

- A. Pipe and conduit ducts, pitch pockets, curb bases, and flashing compatible with the roofing installation shall be provided for roof penetrations. Provide framing or other support around all openings through roof as required to preserve the structural integrity of the roof system and make the penetration weathertight.

3.10 EXCAVATING AND BACKFILLING

- A. Perform trenching, excavating, backfilling for plumbing work as set forth below.
- B. Depth of excavation varies with invert of pipe. Excavation to be carried to a depth of at least 6 inches below bottom of pipe elevation. Fill below pipe (6 inches), around pipe, and a minimum of 12 inches above pipe with sand of Class "B" crushed stone tamped firm and even. Separate topsoil during excavation. Final layer of dirt for exterior installations to be (6 inches minimum) to be topsoil. Backfilling shall be done to exclude use of rock or stone above sand or Class "B" crushed stone.

3.11 TESTS AND INSPECTIONS

- A. General: The Contractor shall make all tests deemed necessary by the inspection departments of the engineer and the authority having jurisdiction, Board of Underwriters, etc. He shall provide all equipment, materials, and labor for making such tests. Fuel and electrical energy for system operational tests following beneficial occupancy by the Owner will be paid for by the Owner.
- B. Other: Additional tests specified hereinafter under the various specification sections shall be made.
- C. Notification: The Owner's Representative shall be notified at his office 36 hours prior to each test and other specifications requirements requiring action on the part of the Owner, Architect, Engineer, and/or Owner's Representative.
- D. Test Logs: All tests which the Contractor conducts shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel, description and extent of system tested, test conditions, test results, specified results, and any other pertinent data. Data shall be delivered to the Owner's Representative as specified under "Requirements for Final Acceptance.
- E. Inspections: In general, an inspection by the Owner's Representative shall be required prior to closing up any work and prior to beneficial occupancy or final project completion. The closing up of work includes, but is not limited to, pipe and conduit installations prior to backfilling; mechanical, plumbing electrical, and fire protection work prior to placement of concrete; or closing up walls and overhead mechanical, plumbing, electrical and fire protection work prior to installation of the ceiling.

3.12 CLEANING AND PAINTING

- A. Thoroughly clean and touch up the finish on all parts of the materials and equipment. Exposed parts in equipment rooms, and all other spaces except sealed chases and attics shall be thoroughly cleaned of cement, plaster, and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out.
- B. All other painting shall be accomplished under the Painting Section of Division 9 of the specifications.

3.13 DISCHARGE OF WASTES FROM CONSTRUCTION SITE

- A. The Contractor shall comply with all applicable provisions of local, state, and federal laws regarding the discharge of wastes into sewer and waterways. Special caution shall be exercised to prevent the discharge of wastes which contain oil, tar, asphalt, roofing compound, kerosene, gasoline, paint, mud, cement, lime, or other materials which would degrade the water quality of the receiving water course. The Contractor shall construct and maintain oil interceptors, settling basins, acid neutralization tanks, and/or other effective pollution countermeasures, as required by the Texas Water Quality Board.
- B. On LEED and CHPS projects, contractor is responsible for tracking waste leaving the jobsite. All waste on these projects to be sorted and processed during construction.

END OF SECTION 220100

SECTION 220500**BASIC PLUMBING MATERIALS AND METHODS****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following basic plumbing materials and methods to complement other Plumbing Sections.
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Concrete base construction requirements.
 - 3. Escutcheons.
 - 4. Dielectric fittings.
 - 5. Dielectric isolation tape
 - 6. Flexible connectors.
 - 7. Mechanical sleeve seals.
 - 8. Nonshrink grout for equipment installations.
 - 9. Field-fabricated metal and wood equipment supports.
 - 10. Installation requirements common to equipment specification sections.
 - 11. Mechanical demolition.
 - 12. Cutting and patching.
 - 13. Touchup painting and finishing.
 - 14. Access Doors
- B. Pipe and pipe fitting materials are specified in Plumbing piping system Sections, if applicable.

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. NP: Nylon plastic.
 - 4. PE: Polyethylene plastic.
 - 5. PVC: Polyvinyl chloride plastic.

- G. The following are industry abbreviations for rubber materials:
1. CR: Chlorosulfonated polyethylene synthetic rubber.
 2. EPDM: Ethylene propylene diene terpolymer rubber.

1.3 SUBMITTALS

- A. Product Data: For dielectric fittings, flexible connectors, access doors, solder/brazing material and mechanical sleeve seals.
- B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- C. Coordination Drawings: Detail major elements, components, and systems of plumbing equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
1. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 2. Equipment and accessory service connections and support details.
 3. Fire-rated wall and floor penetrations.
 4. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
 5. Access panel and door locations

1.4 QUALITY ASSURANCE

- A. **All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner's Representative prior to bidding may be furnished.**
- B. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- D. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate plumbing equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for plumbing installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of plumbing systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors if plumbing items requiring access are concealed behind finished surfaces.
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dielectric Tape:
 - a. Holdrite (#272-4).
 - 2. Metal, Flexible Connectors:
 - a. Flexicraft Industries.
 - b. Flex-Weld, Inc.
 - c. Grinnell Corp.; Grinnell Supply Sales Co.
 - d. Mercer Rubber Co.
 - e. Metraflex Co.
 - f. Uniflex, Inc.
 - 3. Rubber, Flexible Connectors:
 - a. General Rubber Corp.
 - b. Mercer Rubber Co.
 - c. Metraflex Co.
 - d. Red Valve Co., Inc.
 - e. Uniflex, Inc.

4. Mechanical Sleeve Seals:
 - a. Calpico, Inc.
 - b. Metraflex Co.
 - c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

- A. Refer to individual Specification piping Sections for pipe and fitting materials and joining methods, if applicable.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Specification piping Sections for special joining materials not listed below, if applicable.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32.
 1. ASTM B 32, 95/5 lead-free alloys. Include water –flushable and soluble flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8.
 1. BCuP Series: Copper-phosphorus alloys.
 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements: Manufacturer's standard solvent cements for the following:
 1. CPVC Piping: ASTM F 493.
 2. PVC Piping: ASTM D 2564, medium bodied (bond). Include purple primer according to ASTM F 656.
- I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.
- J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
 1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature, to prevent galvanic action and stop corrosion. Unions in first paragraph below are available in at least NPS 1/2 to NPS 2.
- B. Dielectric Unions:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. EPCO Sales, Inc.
 - d. Hart Industries International, Inc.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - f. Zurn Plumbing Products Group; Wilkins Water Control Products.
 2. Description:
 - a. Pressure Rating: 250 psig at 180 deg F.
 - b. End Connections: Solder-joint copper alloy and threaded ferrous.
 - c. Flanges in first paragraph below are available in at least NPS 1-1/2 to NPS 4.
- C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. EPCO Sales, Inc.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Factory-fabricated, bolted, companion-flange assembly.
 - b. Pressure Rating: 175 psig minimum.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 2. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: 150 psig.
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.
- E. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Calpico, Inc.
 - b. Lochinvar Corporation.
 2. Description:
 - a. Galvanized-steel coupling.
 - b. Pressure Rating: 300 psig at 225 deg F.
 - c. End Connections: Female threaded.
 - d. Lining: Inert and noncorrosive, thermoplastic.
- F. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Perfection Corporation; a subsidiary of American Meter Company.
 - b. Precision Plumbing Products, Inc.
 - c. Victaulic Company.
 2. Description:
 - a. Electroplated steel nipple complying with ASTM F 1545.
 - b. Pressure Rating: 300 psig at 225 deg F.
 - c. End Connections: Male threaded or grooved.
 - d. Lining: Inert and noncorrosive, propylene.

2.5 DIELECTRIC ISOLATION TAPE

- A. Tape to eliminate dissimilar metal contact: (equal to Holdrite #272-4)
1. White Polyester Felt. Pressure sensitive adhesive rubber base (one side only).
 2. 4" width.

2.6 FLEXIBLE CONNECTORS

- A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:
1. 2-Inch NPS and Smaller: Threaded.
 2. 2-1/2-Inch NPS and Larger: Flanged.
 3. Option for 2-1/2-Inch NPS and Larger: Grooved for use with keyed couplings.
- B. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.
- C. Rubber, Flexible Connectors: CR or EPDM elastomer rubber construction, with multiple plies of NP fabric, molded and cured in hydraulic presses. Include 125-psig minimum working-pressure rating at 220 deg F. Units may be straight or elbow type, unless otherwise indicated.

2.7 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe materials and size of pipe.
 2. Pressure Plates: Stainless steel.

3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.8 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
 1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
 5. Sleeve Fasteners: Manufactured, steel clips for securement during pour. Equal to B-line, BD40, BE-5-8 or BE-9-12.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 2. OD: Completely cover opening.
 3. Cast Brass: One piece, with set screw. (split face acceptable for existing piping)
 - a. Finish: Polished chrome-plate.

2.9 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psi, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

2.10 ACCESS DOORS

- A. General: Provide access doors for all serviceable mechanical appurtenances (valves, trap primers, shock arresters, actuators, sensors, etcetera) in inaccessible locations. Such locations include gypsum, brick and CMU ceilings and walls.
- B. Location of panels shall be carefully coordinated with other Exposed Devices as described in earlier paragraphs.
- C. Manufacturers shall be Milcor, Mifab, or approved equal. Unless indicated otherwise, use panels equal to Milcor Style M for masonry and drywall construction, equal to Milcor Style K for plastered masonry walls and ceilings. Stainless steel panels shall be used in ceramic tile or glazed structural tile.
- D. Minimum construction features include 16-gage frame and door, continuous hinges, cam-style latch and 10"x10" unobstructed opening size.
- E. UL labeled when in fire-rated construction, one and one-half hour rating.

- F. Access doors located outside, in restrooms or in a moisture-laden environment (dressing area, shower area, lockers, etcetera) shall be stainless steel construction.
- G. Equipment access doors shall be of sufficient size to remove/replace equipment and provide routine maintenance as necessary, unless otherwise noted. Doors shall be set flush with adjacent finish surfaces. All access doors shall be provided with cylinder locks. All access doors (MEP) shall have one (1) common key.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS AND APPLICATIONS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. All piping to be installed in compliance with current NEC required clearances.
- D. Install manufactured isolation clamps at all dissimilar metal pipe supports. Install dielectric isolation tape (engineer approved) only when a manufactured isolation clamp is not available.
- E. Install piping at indicated slope.
- F. Install components with pressure rating equal to or greater than system operating pressure.
- G. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- H. Install piping free of sags and bends.
- I. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- J. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- K. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- L. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- M. Install fittings for changes in direction and branch connections.
- N. Install couplings according to manufacturer's written instructions.
- O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestop materials and installations.

1. Fire-stop all sleeves at floor penetrations of multistory buildings including underfloor penetrations.
- P. Verify final equipment locations for roughing-in.
- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- R. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
 4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
 7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
 8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. CPVC Piping: ASTM D 2846 and ASTM F 493.
 - c. PVC Pressure Piping: ASTM D 2672.
 - d. PVC Nonpressure Piping: ASTM D 2855.
 9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.
 - a. Plain-End Pipe and Fittings: Use butt fusion.
 - b. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.2 ESCUTCHEON REQUIREMENTS

- A. Install escutcheons at pipe penetrations of walls, ceilings, and floors in finished areas.
1. Escutcheons for New Piping:
 - a. Piping exposed through floors and walls in finished areas: One piece, cast brass with polished chrome-plated finish with set screw. Deep escutcheons to be provided where standard depth will not fit.
 - b. Escutcheons shall cover entire hole penetration.
 - c. Escutcheon to be appropriately sized for pipe.
 2. Escutcheons for Existing piping:
 - a. Piping exposed through floors and walls in finished areas: Split plate, cast brass with polished chrome-plated finish with set screw. Deep escutcheons to be provided where standard depth will not fit.
 - b. Escutcheons shall cover entire hole penetration.
 - c. Escutcheon to be appropriately sized for pipe.
 3. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.3 PIPE SLEEVE INSTALLATION REQUIREMENTS

- A. Pipe sleeves are required at all through wall and floor penetrations.
1. Sleeves are to be of the following material:
 - a. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.
 2. Sleeves are required for all through floor and wall penetrations. Sleeves to be set and poured in place (in slab applications), secure all sleeves with fasteners.
 3. Sleeves to extend 2 inches past face of floor or wall. Pipe sleeve in finished areas to be flush with wall or floor for installation of escutcheon.
 4. Install sleeves in new partitions, slabs, and walls as they are built.
 5. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.
 6. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.
 7. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.
 8. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated. Seal annular space with water tight sealant. (equal to NP-1). All sleeves and penetrations to maintain rating of wall / floor. Seal pipe penetrations with fire-stopping materials.
 9. Install sleeve materials according to the following applications:
 - a. Sleeves for Piping Passing through Concrete Floor Slabs: galvanized steel pipe.
 - b. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe sleeves.
 - 1) Extend sleeves 2 inches above finished floor level.
 - 2) For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
 10. Sleeves for Piping Passing through Gypsum-Board Partitions:
 - a. Galvanized-steel pipe sleeves.

- b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
- 11. Sleeves for Piping Passing through Concrete Roof Slabs: Reference details.
- 12. Sleeves for Piping Passing through Exterior Concrete Walls:
 - a. Galvanized-steel pipe sleeves.
 - b. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
- 13. Sleeves for Piping Passing through Interior Concrete Walls:
 - a. Galvanized-steel pipe sleeves.
- 14. Mechanical sleeve seals
 - a. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building. Sleeves must be poured in place. Installation of sleeves after wall is constructed is not acceptable.
 - b. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- B. Piping Connections: Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
 - 2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
- B. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3.5 EQUIPMENT INSTALLATION – COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

- E. Install equipment giving right of way to piping installed at required slope.

3.6 PAINTING AND FINISHING

- A. Apply paint to exposed piping according to the following, unless otherwise indicated:
 - 1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
 - 2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
 - 3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
 - 4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
 - 5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
 - 6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
- B. Do not paint piping specialties with factory-applied finish.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment (not to be used at pipe supports).
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.9 DEMOLITION

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.10 CUTTING AND PATCHING

- A. Disconnect, demolish, and remove Work specified in Plumbing Sections.

- B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.
- D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.11 GROUTING

- A. Install nonmetallic, nonshrink, grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 220500

SECTION 220519

METERS AND GAGES FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following meters and gages for plumbing systems:
 - 1. Thermometers.
 - 2. Gages.
 - 3. Test plugs
 - 4. Flow indicators.
 - 5. Temperature and Pressure Test Kit
- B. Related Sections include the following:
 - 1. Specification Section "Domestic Water Piping" for domestic water appurtenances.

1.2 SUBMITTALS

- A. Product Data: For each type of product to be installed.
- B. Operation and Maintenance Data: For all products to be installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

- A. Manufacturers:
 - 1. Palmer - Wahl Instruments Inc.
 - 2. Trerice, H. O. Co.
 - 3. Weiss Instruments, Inc.
 - 4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
- B. Case: Black-finished Aluminum, 9 inches long.
- C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.
- D. Tube Background: Satin-faced, nonreflective aluminum with permanently baked on scale markings on lens (U.V. protected).
- E. Window: Glass.

- F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.
- G. Stem: Brass for thermowell installation and of length to suit installation.
- H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 THERMOWELLS

- A. Manufacturers:
 - 1. Palmer – Wahl Instruments Inc.
 - 2. Terice, H. O. Co.
 - 3. Weiss Instruments, Inc.
 - 4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
- B. Manufacturers: Same as manufacturer of thermometer being used.
- C. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer. Provide extended neck to accommodate insulation thickness.

2.4 PRESSURE GAGES

- A. Manufacturers:
 - 1. Palmer – Wahl Instruments, Inc.
 - 2. Terice, H. O. Co.
 - 3. Weiss Instruments, Inc.
 - 4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
- B. Direct Mounting, Dial-type Dry or Liquid Filled Pressure Gages: Indicating-dial type complying with ASME B40.100.
 - 1. Case: Dry or Liquid-filled type, stainless steel, 4-inch diameter. Weatherproof.
 - 2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
 - 3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
 - 4. Movement: Mechanical, with link to pressure element and connection to pointer.
 - 5. Dial: Satin-faced, nonreflective aluminum with baked on scale markings.
 - 6. Pointer: Red or other dark-color metal.
 - 7. Window: Glass
 - 8. Ring: Stainless
 - 9. Accuracy: Grade B, plus or minus 2 percent of middle half scale.
 - 10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
 - 11. Range of Fluids under Pressure: Two times operating pressure.
- C. Pressure-Gage Fittings:
 - 1. Valves: NPS 1/4 brass or stainless-steel needle type.
 - 2. Syphons: NPS 1/4 coil of brass tubing with threaded ends.
 - 3. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.5 TEST PLUGS (PT PORTS)

- A. Manufacturers:
 - 1. Palmer – Wahl Instruments, Inc.
 - 2. Terrice, H. O. Co.
 - 3. Weiss Instruments, Inc.
 - 4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
- B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.
- C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F
- D. Core Inserts: One or two self-sealing rubber valves.
 - 1. Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.
 - 2. Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

2.6 FLOW INDICATORS

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc. (Series SFI-800 ONLY)
- B. Description: Instrument for installation in piping systems for visual verification of flow. Rated for potable water applications.
- C. Construction: Polysulfone body; with polysulfone sight glass and white polysulfone paddle-wheel indicator, and threaded ends.
- D. Pressure Rating: 150 psig.
- E. Temperature Rating: 212 deg F.
- F. End Connections for NPS 3/4 and Smaller: Threaded.

2.7 TEMPERATURE AND PRESSURE TEST KIT

- A. Test Kit: Furnish (1) test kit containing one pressure gage and adaptor, two (2) thermometers, and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.
 - 1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch diameter dial and probe. Dial range shall be 0 to 200 psig.
 - 2. Low-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch diameter dial and tapered-end sensing element. Dial ranges shall be 25 to 125 deg F.
 - 3. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F.
 - 4. Carrying case shall have formed instrument padding.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

- A. Install liquid-in-glass thermometers in the following locations:

1. Inlet and outlet of each storage tank.
 2. Outlet of all domestic water heaters or boilers.
 3. On hot water return line after circulation pump.
 4. At the following locations for mixing valves:
 - a. HW (inlet to valve).
 - b. HWR (inlet to valve).
 - c. Tempered (outlet of valve).
- B. Provide the following temperature ranges for thermometers:
1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions.
 2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.

3.2 PRESSURE GAGE APPLICATIONS

- A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve and inlet and outlet of all backflow preventers (Domestic water).
- B. Dry type pressure gages to be used on domestic water systems (inlet and outlets of heaters mixing valves, booster pumps and water softeners).

3.3 FLOW INDICATOR APPLICATION

- A. Install wheel type indicator on outlet side of each domestic pump (recirculation or booster).

3.4 INSTALLATIONS

- A. Install direct-mounting thermometers and adjust vertical and tilted positions.
- B. Install thermowells with socket extending to center of pipe and in vertical position in piping tees where thermometers are indicated.
- C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.
- D. Install ¼" NPT, ¼ turn ball-valve and snubber fitting in piping for each pressure gage for fluids.
- E. Install test plugs in tees in piping.
- F. Install flow indicators, in accessible positions for easy viewing, in piping systems.

3.5 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.

3.6 ADJUSTING

- A. Calibrate meters according to manufacturer's written instructions, after installation.
- B. Adjust faces of meters and gages to proper angle for best visibility.

CONSTRUCTION DOCUMENTS

CAMINO REAL WORK FORCE CTR

METERS AND GAGES FOR

PLUMBING

SPECIFICATIONS

RENOVATION & EXPANSION PROJ.

220519

ISSUED FOR CONSTRUCTION

05/05/2021

END OF SECTION 220519

SECTION 220523**GENERAL-DUTY VALVES FOR PLUMBING PIPING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze ball valves.
 - 2. Ductile iron Butterfly valves.
 - 3. Bronze swing check valves.
 - 4. Iron swing check valves.
 - 5. Bronze globe valves.
 - 6. Ductile iron globe valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated and required accessories (chains, extensions, etc.).

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.

- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
 2. Protect threads, flange faces, grooves, and weld ends.
 3. Set globe valves closed to prevent rattling.
 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 5. Set butterfly valves closed or slightly open.
 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
1. Maintain valve end protection.
 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
 2. Handwheel: For valves other than quarter-turn types.
 3. Handlever: For quarter-turn valves NPS 6 and smaller.
 4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.
- E. Valve Action: Close rotation shall be clockwise.
- F. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation. Extension to be provided by valve manufacturer to match specific product.
 2. Butterfly Valves: With extended neck.
- G. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves (with 316 stainless steel bolts).
 2. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Milwaukee Valve Company.
 - c. Mueller Steam Specialty; a division of SPX Corporation.
 - d. NIBCO INC.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless steel, blowout-proof.
 - i. Ball: Stainless steel, vented.
 - j. Port: Full.

2.3 BRONZE SWING CHECK VALVES

- A. Class 150, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Milwaukee Valve Company.
 - c. Mueller Steam Specialty; a division of SPX Corporation.
 - d. NIBCO INC.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 300 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

2.4 IRON SWING CHECK VALVES

- A. Class 250, Iron Swing Check Valves with Metal Seats, potable rated:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Milwaukee Valve Company.
 - c. Mueller Steam Specialty; a division of SPX Corporation.
 - d. NIBCO INC.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 500 psig.

- c. Body Design: Clear or full waterway.
- d. Body Material: ASTM A 126, gray iron with bolted bonnet.
- e. Ends: Flanged.
- f. Trim: Bronze.
- g. Gasket: Asbestos free.
- h. Flange bolts to be 316 stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Install valves with brass short nipples and brass unions at downstream side (outlet) of ball and globe valves (NPS 2 and smaller).**
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem and handle movement. Valve handle to have ample clearance to be fully exercised without interference (full open and full closed) with no modifications to handle.
- F. Install chainwheels on operators for butterfly valves NPS 4 and larger and more than 120 inches above finished floor. Extend chains to 96 inches above finished floor.
- G. All valves NPS 3 and smaller shall be installed within 120 inches above finished floor.
- H. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
- I. For all valves on insulated piping, provide insulated stem extension.
- J. Install shutoff valves immediately upstream of each dielectric fitting.

- K. Provide and install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops.
- L. Provide and install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
 - 1. Drain Valves (At low points in water mains, risers, and branches): Ball valves

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.
- B. Perform the following adjustments before operation:
 - 1. Open shutoff valves to fully open position.
 - 2. Remove and clean strainer screens. Close drain valves and replace drain plugs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. Valve applications, use the following:
 - 1. Shutoff Service: Ball, butterfly valves.
 - 2. Butterfly Valve Dead-End Service: Flange (lug) type.
 - 3. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
 - 2. For Copper Tubing, NPS 2-1/2 and larger: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 - 4. For Steel Piping, NPS 2-1/2 and larger: Flanged ends.

3.5 VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Ball Valves: Two piece, full port, bronze with stainless-steel trim; **with brass short nipple and brass union connection at downstream side (outlet).**
 - 2. Bronze Swing Check Valves.
 - 3. Bronze Globe Valves: **With brass short nipple and brass union connection at downstream side (outlet).**

END OF SECTION 220523

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following hangers and supports for plumbing system piping and equipment.
 - 1. Steel pipe hangers, supports and riser clamps.
 - 2. Thermal-hanger shield inserts and saddles.
 - 3. Fastener systems.
 - 4. Pipe positioning systems.
 - 5. Equipment supports.
- B. Related Sections include the following:
 - 1. All plumbing specification sections.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Weight loading for supports and hangers shall not exceed manufacturers recommended tolerances and limits.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts and saddles.
 - 3. Fastener systems.
 - 4. Pipe positioning systems.

- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze pipe hangers. Include Product Data for components.
 - 2. Metal framing systems. Include Product Data for components.
 - 3. Equipment supports.
- C. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-steel."
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1. "Structural Welding Code-Steel".

PART 2 – PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

- A. **All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner's Representative prior to bidding may be furnished.**
- B. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.

2.2 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.3 METAL COATING REQUIREMENTS:

- A. All metal products shall have the following coatings:
 - 1. Wet/damp areas: hot dipped galvanized.
 - 2. Dry or conditioned areas: pre-galvanized.

2.4 STEEL PIPE HANGERS, SUPPORTS AND RISER CLAMPS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hangers and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.

2. ERICO/Michigan Hanger Co.
 3. Grinnell Corp.
- C. Galvanized, Metallic Coatings: Pre-galvanized (minimum thickness of 0.5 mils) or hot dipped (1.4 to 3.9 thickness).
- D. Nonmetallic Coatings: Plastic coating, jacket or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.
- F. Epoxy Coatings: Copper colored epoxy coating on carbon steel hangers and supports for use on noninsulated copper piping only.
- G. Channel, rod and securement hardware:
1. Channel: 12-ga.
 2. Rod: Sized as scheduled.
 3. Hardware (clamps, bolts, washers, etc): coating per area indication.

2.5 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig minimum, compressive-strength insulation insert with a sheet metal shield.
- B. Manufactures:
1. B-line
 2. ERICO / Michigan Hanger CO
 3. Grinnell Corp
 4. Buckaroos
- C. Insulation –Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier. Wood inserts are not acceptable.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type 1 calcium silicate or ASTM C 552, Type II cellular glass.
- E. Insulation-Insert Material for Cold and Hot Piping, up to 3" diameter: Molded fiberglass block, 20 lbs/ft³ density, thermal conductivity of 0.30.

2.6 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened Portland cement concrete with pull-out, tension and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Hilti, Inc.
 - c. Powers Fasteners.
- B. Concrete Insert: electroplated steel finish, for embedding in concrete. Steel insert nut for rod attachment.
1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Hilti, Inc.

- c. Powers Fasteners.

2.7 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, system of metal brackets, clips and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.
- B. Manufacturers:
 - 1. C&S Mfg. Corp.
 - 2. HOLDRITE Corp.; Hubbard Enterprises.
 - 3. Samco Stamping Inc.

2.8 EQUIPMENT SUPPORTS

- A. Description: Welded, shop or field-fabricated equipment support made from structural-steel shapes.

2.9 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes and bars. Galvanized only. Painted steel not acceptable.

PART 3 - EXECUTION

3.1 HANGERS AND SUPPORTS APPLICATIONS AND INSTALLATION

- A. Specific hanger and support requirements are specified in Hanger Application Schedule below.
- B. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps and attachments as required to properly support piping from building structure; attaching to metal roof decks is not permissible.
- C. Use hangers and supports with galvanized, metallic coatings for piping. Field applied finish is not acceptable.
- D. Use nonmetallic plastic or epoxy coating, jacket or liner coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Rod to be installed plumb. Bending rod is not acceptable. Provide and install required attachments.
- G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Heavy Duty Steel Clevis Hangers: For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 - 2. Strut System Clamps: For attachment of piping to channel. NPS 1/2 to NPS 2.
 - a. Noninsulated copper piping to have dielectric insert. (dielectric tape not acceptable).

3. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 - a. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 - b. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
4. Install hangers for piping with the following maximum horizontal spacing and minimum rod diameters (hangers shall be spaced to prevent sagging):
 - a. NPS 2 and Smaller: 60 inches with 3/8-inch rod.
 - b. NPS 2-1/2 to 5: 60 inches with 1/2-inch rod.
 - c. NPS 6 to 8: 60 inches with 3/4-inch rod.
- H. Vertical-Piping Riser Clamps: Unless otherwise indicated and except as specified in piping system Section, install the following types:
 1. Required at all risers from under-floor or through floors from floor below. Risers clamps to be installed every 10 ft max. Coordinate installation with sleeves.
- I. Building and Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Wide Jaw C-Clamps: For structural shapes, with retaining clip.
 2. NPS 2 and smaller: mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
 3. NPS 2 1/2 and larger: Concrete spot insert. Install building attachments within concrete slabs. Install additional attachments at concentrate loads, including valves, flanges and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Insulation Piping Installation:
 1. Provide manufacture galvanized metal shield with locking tabs or securement band.
 2. For Trapeze or Clamped Systems: Thermal insert and shield shall cover entire circumference of pipe.
 3. For Clevis or Band Hangers: Thermal insert and shield shall cover lower 180 degrees of pipe.
 4. Thermal Insert Length: Extend 4 inches beyond sheet metal shield for piping operating below ambient air temperature.
- K. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures; minimum three (3) for vertical pipe sections.
- L. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer Specification Section "Plumbing Fixtures" for plumbing fixtures.
- M. Install hangers and supports complete with necessary inserts, bolts, rods, nuts washers and other accessories.
- N. Load Distribution: Install hangers and supports so piping live and dead loads and stressed from movement will not be transmitted to connected equipment.
- O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

3.2 EQUIPMENT SUPPORTS

- A. Manufacturer's structural-steel system to suspend equipment from structure overhead or to support equipment above floor.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1 inch.

3.4 PAINTING

- A. Repair Galvanized Surfaces: Clean welds, bolted connections and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 220529

SECTION 220553**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels
 - 3. Pipe labels.
 - 4. Valve tags.
 - 5. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS**2.1 EQUIPMENT LABELS**

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, **1/8 inch** thick, and having predrilled holes for attachment hardware.

2. Letter Color: **White.**
 3. Background Color: **Black.**
 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless-steel **rivets or self-tapping screws.**
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2 by 11 inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-Steel self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.4 VALVE TAGS

- A. Valve Tags: Stamped or engrave with ¼ inch letters piping system abbreviation and ½ inch numbers.
- B. Valve Schedules: For each piping system, on 8-1/2 by 11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of a valve (room or space), normal-operating position (open, closed or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance date.

2.5 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, or plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches.
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER", "CAUTION", OR "DO NOT OPERATE".
 - 4. Color: yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces or substances that could impair band of identification devices, including dirt, oil, grease, release agents and incompatible primers, paints and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Specification Section "Interior Painting".

- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels and plenums; and exterior exposed locations as follows:
1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings and inaccessible enclosures.
 4. At access doors, manholes and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
1. Domestic Water Piping:
 - a. Background Color: Blue.
 - b. Letter Color: White.
 2. Domestic Hot Water Piping:
 - a. Background Color: Red.
 - b. Letter Color: White.
 3. Sanitary Waste and Vent and Storm Drainage Piping:
 - a. Background Color: Green.
 - b. Letter Color: White

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and controls devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
1. Valve-Tag Size and Shape:
 - a. Cold Water: 1-1/2 inches round.
 - b. Hot Water: 1-1/2 inches square.
 2. Valve-Tag Color:
 - a. Cold Water: Blue.
 - b. Hot Water: Orange.
 3. Letter Color:
 - a. Cold Water: Black.
 - b. Hot Water: Black

3.5 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220716

PLUMBING INSULATION

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes plumbing insulation for equipment and pipe, including the following:
 - 1. Insulation Materials:
 - a. Cellular glass.
 - b. Flexible Elastomeric.
 - c. Mineral fiber.
 - d. Phenolic
 - 2. Adhesives.
 - 3. Mastics.
 - 4. Sealants.
 - 5. Factory-applied jackets.
 - 6. Field-applied tape.
 - 7. Field-applied jackets.
 - 8. Securements.
- B. Related Sections include the following:
 - 1. Specification Section "Hangers and Supports" for high-density inserts at hangers; **wood inserts at hangers are not acceptable.**
 - 2. Specification Section "Special Conditions for All Plumbing Work".
 - 3. Specification Section "Basic Plumbing Materials and Methods".
- C. Not all items listed within this specification are used. Use only items applicable per application schedule.

1.3 DEFINITIONS

- A. ASJ: All-service jacket.
- B. CONCEALED: Covered or concealed by a ceiling (gypsum or lay-in acoustical tile) or wall.
- C. EXPOSED: Open to view; not concealed by a ceiling or wall of any sort.
- D. FSK: Foil, scrim, kraft paper.
- E. UNDERFLOOR: Accessible crawl space beneath lowest floor level (considered "outdoors").

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any). Provide submittal data on all products to be used.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.
- B. All products to be stored in a dry location, protected from the elements. All damaged insulation to be replaced.

1.7 COORDINATION

- A. Coordinate size and location of supports, hangers, and high-density insulation inserts and shields specified in Specification Section "Hangers and Supports." Coordinate with drawing details where applicable; wood inserts at hangers are not acceptable.
- B. Coordinate clearance requirements with piping Installer for piping insulation application, and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.
- C. Insulation not to be installed until building is dried in.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 INSULATION MATERIALS

- A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Phenolic:
 - 1. Products
 - a. Insul-phen
 - 2. 100% CFC-free, HCFC-free, and halogen-free, closed cell rigid phenolic foam insulation.
 - 3. Minimal thermal conductivity @ 75° F.
 - a. Green, 2.5 lb/ft³. 0.15 (Btu.in/hr.ft².F)
 - b. Pink, 5.0 lb/ft³. 0.21 (Btu.in/hr.ft². F)
- G. Cellular Glass:
 - 1. Products:
 - a. Pittsburgh Corning Corporation; Foamglas Super K.
 - 2. Block Insulation: ASTM C 552, Type I.
 - 3. Special-Shaped Insulation: ASTM C 552, Type III.
 - 4. Board Insulation: ASTM C 552, Type IV.
 - 5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
 - 7. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Minimal thermal conductivity at 75° F of 0.29 (Btu.in/hr.ft². F) (R-value of 10.34 @ 3 inches thickness). Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
- H. Flexible Elastomeric:
 - 1. Products:
 - a. Aeroflex USA Inc.; Aerocel.
 - b. Armacel LLC; AP Armaflex.
 - 2. Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - 3. Minimal thermal conductivity at 75° F of 0.25 (Btu.in/hr.ft². F.)
- I. Mineral-Fiber Blanket Insulation:
 - 1. Products:
 - a. Johns Manville; Microlite.

- b. Knauf Insulation; Duct Wrap
 - c. Owens-Corning; All-Service Duct Wrap.
 - 2. Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied jackets" Article.
- J. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products:
 - a. Johns Manville; Micro-Lok.
 - b. Knauf Insulation; 1000° Pipe Insulation.
 - c. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
- K. Fire Rated Wrap
 - 1. Manufacturers:
 - a. 3M
 - b. Specialty Products and Insulation Co.
 - 2. Insulation Materials: Fire rated fiber wrap insulation: 1-1/2 inch thick low bio-persistent Alka-line Earth Silicate fiber with melting point at 2200 degrees F. jacket shall be foil faced (one side) Kraft fiber paper with a concealed reinforcing scrim. (FSK) One hour rating with 1-layer of wrap, 3 inches to combustibles. Two hour rating with 2 layers of wrap, 0 inch to combustibles.
 - 3. Accessories and Attachments:
 - a. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq.yd.
 - 1) Tape Width: 4 inches.
 - b. Bands: 3/4 inch wide, in one of the following materials compatible with jacket.
 - 1) Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
 - c. Insulation Anchor Pins and Speed Washers: Galvanized steel plate, pin and washer manufactured for attachment to duct by weld. Pin length sufficient for insulation thickness indicated.
 - d. Vapor Retarders: Mastics: Materials recommended by insulation material manufacturers that are compatible with insulation materials, jackets, and substrates.
 - 4. Secured per manufacturer's requirements and AHJ.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated. All products are to contain low V.O.C. as defined/governed by LEED IEQ 4.1 and 4.2 (Regardless of project type).
- B. Cellular-Glass, Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
 - 1. Products:
 - a. Foamglas: Pittseal 444N or equal
- C. Flexible Elastomeric: Comply with MIL-A-24179A, Type II, Class I.
 - 1. Products:
 - a. K-Flex: 720 LVOC or equal

- D. Phenolic: Water based adhesive with a service temp of minus 20°F to 700°F.
 - 1. Products:
 - a. Foster 97-15
- E. Metal Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products:
 - a. Design Polymerics, DP2502 (or approved equal).

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II. All products are to contain low V.O.C. as defined/governed by LEED IEQ 4.1 and 4.2 (Regardless of project type).
- B. Vapor-Barrier Mastic: Water based; suitable for outdoor use on below ambient services, or indoor vapor barrier use.
 - 1. Products:
 - a. Childers Products, Division of ITW; CP-35.
 - 2. Water-Vapor Permeance: ASTM F 1249, 0.09 perm at 55-mils film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 190 deg F.
 - 4. Solids Content: ASTM D 1644, 60 percent by volume and 73 percent by weight.
 - 5. Color: White.
 - 6. VOC: 36 g/l.

2.5 SEALANTS

- A. Joint Sealants:
 - 1. Joint Sealants for Cellular-Glass Products:
 - a. Pittsburgh Corning Corporation; Pittseal 444N.
 - 2. Joint Sealant for Phenolic Products
 - a. Foster 95-50
- B. Metal Jacket:
 - 1. Products:
 - a. Foster 95-44 or equal.
 - b. Childers Products, Division of ITW; CP-76.
- C. Mineral Fiber:
 - 1. Design Polymerics DP 2502.
 - 2. Childers Products, Division of ITW; CP-35.
- D. PVC Jacket:
 - 1. Childers Products, Division of ITW; CP-35.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, 25/50 ASTM-F 84, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Products:
 - a. Johns Manville; Zeston.
 - b. Proto PVC Corporation; LoSmoke.
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White:
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
 - 5. Factory-fabricated tank heads and tank side panels.
- C. Metal Jacket:
 - 1. Products:
 - a. Childers Products, Division of ITW; Metal Jacketing Systems.
 - b. PABCO Metals Corporation; Surefit.
 - c. RPR Products, Inc.; Insul-Mate.
 - 2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 - a. Factory cut and rolled to size.
 - b. Finish and thickness are indicated in field-applied jacket schedules.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.
 - 1. Width: 3 inches.
 - 2. Thickness: 14.0 mils.
 - 3. Adhesion: 73 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 55 lbf/inch in width.
 - 6. Color: White
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.
 - 1. Width: 3 inches.
 - 2. Thickness: 13 mils.
 - 3. Adhesion: 73 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. Color: Silver

2.9 SECUREMENTS

- A. Bands:
 - 1. Products:
 - a. Childers Products; Bands.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 316; 0.015 inch thick, 3/4 inch wide with wing or closed seal.
 3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch with wing or closed seal.
 4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application. For Stainless Steel; apply a corrosion coating to insulated surfaces with an epoxy primer and an epoxy finish 5 mils thick.
- B. Verify and coordinate insulation installation with the systems and trades installing heat tracing. Comply with requirements for heat tracing that applies to insulation.

3.3 COMMON INSTALLATION REQUIREMENTS

- A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties
- C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, and pipe system as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Install high-density inserts at hanger locations prior to insulating; wood or block inserts are not acceptable
- F. Do not weld brackets, clips, pins or other attachment devices to piping, fittings, tanks, coils, equipment, vessel, and specialties.
- G. Keep insulation materials clean and dry before, during application, and finishing.

- H. Install insulation with tight longitudinal seams and end joints, with least number of joints practical.
- I. Install insulation so that material is not over compressed.
- J. Seal all joints, and seams, including penetrations in insulation, at supports, and other projections with insulation of same material overlapped by 2". Secure strips with outward clinching staples along both edges of strip, (spaced 1 inch on center) and seal entire joint or seam with mastic.
- K. Do not insulate, conceal, or enclose pipe hangers, channel and steel supports, etc. not directly fasten to duct.
- L. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- M. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses. Do not water down products unless directed by manufacture. Use clean potable demineralized water when required.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair all damage insulation prior to concealment as noted above.
- P. Do not insulation or conceal vibration-control devices, labels, stamps, nameplates, data plates, manholes, cleanouts, etc. require for maintenances.
- Q. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarded integrity, unless otherwise indicated.
- R. Insulate pipe elbows, tees, valves, strainers, flanges, etc., using preformed fitting insulation, mitered fittings or oversized preformed pipe insulation made from same material thickness and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, voids, and irregular surfaces with insulating mastic finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation. Provide a removable reusable insulation cover; design that maintains vapor barrier. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts.
- S. Cover segmented insulated surfaces with a layer of finishing mastic prior to jacket installation.
- T. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Secure PVC covers to adjoining insulation facing using staples and ASJ tape. Seal PVC fitting covers with mastic.
- U. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating adhesive and finish with finishing mastic. All connections are to be accessible.
- V. Install removable insulation segment and covers at flanges, valves, controls, unions, equipment access doors, manholes, hand holes, and other elements that require frequent

removal for service and inspection. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.4 PENETRATIONS

- A. Install insulation continuously through all walls, floors, and partitions penetrations and sleeves.
- B. Extend jacket of outdoor installation into wall and roof jacks by 2 inches. Seal jacket to roof flashing with approved flashing sealant.
- C. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with approved flashing sealant.

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Preformed Pipe Insulation Installation on Pipe, Fittings, Valves, Flanges, Tanks, Elbows, and Appurtenances for Cellular- Glass, Mineral- Fiber, Flexible Elastomeric, and Phenolic insulations:
 - 1. Install insulation in a manner that secures material to system being insulated with staples, tape and mastic.
 - 2. When insulation with preformed pipe insulation, seal all longitudinal seams, end joints, and protrusions with manufacturers recommended tape matching jacket, vapor-barrier mastic, joint sealant, and adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
 - 3. Secure fittings, jacket, cover, etc. with tape matching jacket and secure with outward clinched staples 1 inch on center. Apply vapor-barrier mastic over staples.
 - 4. Arrange insulation to permit access to valves packing, flanges, unions, etc. and valve operation for maintenance without disturbing insulation. Install insulation so that it can be removed without damage to surrounding insulation or access enclosure.
 - 5. Pipe hangers are not to be concealed in insulation.
 - 6. Seal all exposed insulation ends with mastic.
 - 7. Seal all mitered joints prior to installing covers with vapor-barrier mastic.
 - 8. Install preformed pipe insulation to outer diameter of pipe flange.
 - 9. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 10. Fill voids between inner circumference of valves, flange, elbows, and bolts insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 - 11. Install preformed sections of same material insulation when available. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Install PVC cover over fitting or mitered section.
 - 12. Arrange insulation to permit access to valves packing, flanges, unions, etc. and valve operation for maintenance without disturbing insulation. Install insulation so that it can be removed without damage to surrounding insulation or access enclosure.

3.6 GENERAL BLANKET INSULATION INSTALLATION (IN ADDITION TO COMMON REQUIREMENTS)

- A. Blanket Insulation Installation on Pipes, Drains, Tanks, Vessels, Elbows, and Appurtenances:

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for a minimum of 50 percent coverage of insulated surface and 100 percent coverage of equipment, tanks, etc.; to secure insulation to surfaces. Apply adhesive to entire circumference of all surfaces; including fittings and transitions.
2. Install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 3/4-inch outward-clinching staples, 1 inch on center. Coat all seams/joints with mastic.
3. Repair punctures, tears, penetrations and protrusions with 6-inch-wide strips of same material used to insulate duct. Seal all seams with staples, cover with mastic and cover with embedded fiberglass reinforced mesh, cover mesh with finish coat of mastic.
4. Do not conceal hangers beneath/under insulation.
5. Insulation termination: Butt insulation up to termination point. Apply mastic no less than 3" overlap on insulation, and 3" on metal surface.

3.7 FIELD-APPLIED JACKET INSTALLATION

- A. Install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Apply two continuous beads of sealant to seams and joints, one bead under lap and the finish bead along seam and joint edge. Secure metal jacket with stainless-steel bands 12 inches on center and at end joints.

3.8 FINISHES

- A. Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in painting Sections (if applicable).
 1. Flat Acrylic Finish: Two (2) finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 1. Inspect insulated pipe, and equipment, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two (3) location(s) for each system.
 2. All insulation applications will be considered defective work if sample inspection reveals noncompliance with requirements.
 3. Remove all defective work and install new insulation and jackets to replace insulation and jackets removed for inspection. Repeat inspection procedures as needed.

3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
1. Fire-suppression piping.
 2. Drainage piping located in crawl spaces.
 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water:
1. Concealed Locations:
 - a. 0 through 1-1/4" Pipe Size: Insulation shall be any of the following:
 - 1) Mineral Fiber Preformed: Type 1: 1-inch thick.
 - 2) Phenolic (2.5 lb/ft³), 1-inch thick.
 - 3) Cellular Glass: 1-1/2 inches thick.
 - b. 1-1/2" and Larger Pipe Size: Insulation shall be any of the following:
 - 4) Mineral Fiber Preformed: Type 1: 1-1/2"-inch thick.
 - 5) Phenolic (2.5 lb/ft³), 1-1/2"-inch thick.
 - 6) Cellular Glass: 1-1/2 inches thick.
 2. Exposed Locations: (including inside mechanical rooms):
 - a. 0 through 1-1/4" Pipe Size: Insulation shall be any of the following:
 - 1) Phenolic (3.5 lb/ft³), 1-inch thick.
 - 2) Cellular Glass: 1-1/2 inches thick.
 - 3) Mineral Fiber Preformed: Type 1: 1-inch thick.
 - b. 1-1/2" and Larger Pipe Size: Insulation shall be any of the following:
 - 4) Phenolic (3.5 lb/ft³), 1-1/2-inch thick.
 - 5) Cellular Glass: 1-1/2 inches thick.
 - 6) Mineral Fiber Preformed: Type 1: 1-1/2"-inch thick.
- B. Condensate, Equipment Drain, Floor Drains, Traps and Waste Water below 60 Deg F:
1. All PVC Piping exposed to and in a Return Air Plenum: Insulation shall be any of the following:
 - a. Fire rated wrap.
 2. All Other Pipe: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Phenolic (2.5 lb/ft³): 1-1/2 inches thick.
- C. Horizontal Storm Water Piping (continuous from roof drain body to first vertical drop):
1. All PVC Piping exposed to and in a Return Air Plenum: Insulation shall be any of the following:
 - a. Fire rated wrap.
 2. All Other Pipe: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Phenolic (2.5 lb/ft³): 1-1/2 inches thick.
 - c. Mineral Fiber, Preformed, Type 1: 1-inch thick.
- D. Roof Drain Body:
1. PVC Roof Drain Body exposed to and in a Return Air Plenum: Insulation shall be any of the following:
 - a. Fire rated wrap.
 2. All Other Roof Drain Bodies: Insulation shall be any of the following:
 - a. Mineral-Fiber Blanket Insulation: 1-1/2 inch thick.
- E. Sanitary Waste & Vent; Domestic Water piping:

1. All PVC Piping exposed to and in a Return Air Plenum: Insulation shall be any of the following:
 - a. Fire rated wrap.

3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE (ATTIC AND CRAWL SPACE INCLUDED)

- A. Domestic Cold, Hot and Recirculated Hot Water:
 1. All Pipe Sizes: Insulation shall be any of the following:
 - a. Pre-insulated Pipe: 1-1/2" thick (underfloor, outdoors and buried)
 - b. Cellular Glass: 2 inches thick (outdoors, not acceptable indoors)
 - c. Phenolic (5 lb/ft³): 2 inches thick (outdoors, not acceptable indoors)
 - d. Mineral Fiber Preformed, Type 1: 1-1/2 inch thick (uninsulated Attic space)
- B. Condensate, Equipment Drain, Floor Drains, Traps and Waste Water below 60 Deg. F:
 1. All Pipe Sizes: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick
 - b. Phenolic (5 lb/ft³): 1-1/2 inches thick
 2. Insulation shall be continuous until the connection to the sanitary system.
- C. Fire Protection:
 1. All Pipe Sizes: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick
 - b. Phenolic (5 lb/ft³): 1-1/2 inches thick

3.13 INSIDE EXTERIOR WALL PIPING INSULATION SCHEDULE

- A. Domestic Cold, Hot and Recirculated Hot Water:
 1. All Pipe Sizes: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick
 - b. Phenolic (2.5 lb/ft³): 1 inch thick
 - c. Mineral Fiber Preformed, Type 1: 1 inch thick, coat entire ASJ jacket with vapor mastic
- B. Condensate, Equipment Drain, Floor Drains, Traps and Waste Water below 60 Deg. F:
 1. All Pipe Sizes: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick
 - b. Phenolic (2.5 lb/ft³): 1-1/2 inches thick
- C. Fire Protection:
 1. All Pipe Sizes: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick
 - b. Phenolic (2.5 lb/ft³): 1-1/2 inches thick

3.14 FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. Piping exposed in finish interior areas, outdoors, in underfloor, mechanical rooms:
 1. Aluminum, Stucco Embossed: 0.016 inch thick.
- C. Indoor piping fitting or elbows:
 1. PVC: (0.015 inch thick).

CONSTRUCTION DOCUMENTS
SPECIFICATIONS
ISSUED FOR CONSTRUCTION

CAMINO REAL WORK FORCE CTR
RENOVATION & EXPANSION PROJ.

PLUMBING INSULATION
220716
05/05/2021

END OF SECTION 220716

SECTION 221116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
 - 2. Encasement for piping.

1.3 SUBMITTALS

- A. Product Data: For the following products:
 - 1. Piping and fittings.
- B. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency. Origin of product to be domestic. No imported product will be acceptable.
- B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
- C. Comply with NSF 61 for potable domestic water piping and components.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not proceed with interruption of water service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L or K water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast copper-alloy or ASME B16.22, wrought-copper, solder fittings.
- B. Soft Copper Tube: ASTM B 88, Type L or K water tube, annealed temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast copper-alloy or ASME B16.22, wrought-copper, solder fittings.
- C. Copper Pipe, Pre-insulated:
 - 1. 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:
 - a. Insul-Pipe Systems, Inc.
 - b. Insul-tek
 - c. Thermal Pipe Systems, Inc.
 - d. Thermacor Process L.P.
 - 2. Description: Factory pre-insulated double-wall pipe system.
 - 3. Carrier Pipe: Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B).
 - 4. Wrought-Copper Fittings: ASME B16.22.
 - 5. Pipe Insulation: Foamed-in-place polyurethane, 90% closed cell, poured in place, "K" = 0.14 per inch @ 75 degrees F, with a density of not less than 2.5 lbs. per cubic foot. Insulation shall be completely encased within a seamless jacket.
 - a. Insulation at each end of each length of pipe shall be protected with an end seal bonded both to the carrier pipe and the outer jacket. Piping cuts made in the field must be provided with end-seals equal to factory type.
 - b. Insulation thickness, minimum: 1.12-inches for NPS 2 and smaller; 1.67-inches for NPS 2-1/2; 1.42-inches for NPS 3; 1.93-inches for NPS 4; and 1.93-inches for NPS 6.
 - 6. Jacket: PVC; ASTM D-1784, Class 12454-B, of not less than .060 inches thick and able to withstand H-20 highway loading.
 - 7. Fitting insulation: Coupling joints on straight runs shall be field wrapped with a mold/jacket of roll PVC, sealed with self seal tape and filled with field mixed pour polyurethane foam. Fittings shall be field insulated using a field mixed polyurethane poured between the fitting and a PVC fitting cover supplied by the manufacturer that is sealed with self seal tape. Vapor barrier jacketing material for fittings and joints shall be of the same material as the pipe jacketing. Installation shall be as per manufacturer's instructions.

2.3 NIPPLES

- A. Brass Nipple: ASTM B687-88
 - 1. Threads: NPT (Federal Services Handbook H-28)
 - 2. Potable use.

2.4 UNIONS

- A. Factory-fabricated, brass or bronze union assembly, for 150-psig minimum working pressure at 180 deg F, ASTM B687-88
- B. End Connections: Solder-joint copper alloy and / or threaded ferrous.

- C. Potable use.

2.5 FLANGES

- A. Factory-fabricated, bronze union assembly, for 150-psig minimum working pressure at 180 deg F, ASME B16.24, Class 150.
- B. End Connections: Solder-joint copper alloy and / or threaded ferrous.
- C. Potable use.
- D. All bolts to be 316 stainless steel (Class 150).

2.6 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.
- B. Solder Filler Metals: ASTM B 32, 95/5 lead-free alloys. Include water-flushable and soluble flux according to ASTM B 813.
- C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.7 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105.
- B. Form: Tube.
- C. Material: LLDPE film of 0.008-inch minimum thickness or high-density, cross-laminated PE film of 0.004-inch minimum thickness.
- D. Color: Black or blue.

2.8 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cascade Waterworks Manufacturing.
 - b. Dresser, Inc.; Dresser Piping Specialties.
 - c. Ford Meter Box Company, Inc. (The).
 - d. JCM Industries.
 - e. Romac Industries, Inc.

- f. Smith-Blair, Inc; a Sensus company.
 - g. Viking Johnson; c/o Mueller Co.
- D. Plastic-to-Metal Transition Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Charlotte Pipe and Foundry Company.
 - b. Harvel Plastics, Inc.
 - c. Spears Manufacturing Company.
 - 2. Description: CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket end.
- E. Plastic-to-Metal Transition Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Colonial Engineering, Inc.
 - b. NIBCO INC.
 - c. Spears Manufacturing Company.
 - 2. Description: CPVC four-part union. Include brass threaded end, solvent-cement-joint plastic end, rubber O-ring, and union nut.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105.
- D. Provide and install shutoff valve, strainer, pressure reducing valve, hose-end drain valve, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Section "Meters and Gages" for pressure gages and Section "Domestic Water Piping Specialties" for drain valves and strainers.
- E. Install domestic water piping level and plumb.
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping adjacent to equipment and specialties to allow service and maintenance.

- J. Install piping to permit valve servicing.
- K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.
- N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty valves.
- O. All pipe nipples to be brass.

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join and prepare/clean copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- F. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- G. All piping is to be cleaned prior to concealment.

3.3 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. NPS 2 and Smaller: Fitting-type coupling.
 - 2. NPS 2-1/2 and Larger: mechanical joint-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition unions.

3.4 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.

- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to all equipment.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Piping Inspections:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by engineer and authorities having jurisdiction
 - 2. During installation, notify engineer and authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of engineer and authority having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for engineer and authority having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If the engineer or authority having jurisdiction finds that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by engineer and authority having jurisdiction.
- C. Piping Tests:
 - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 - 6. Prepare reports for tests and for corrective action required.
- D. Domestic water piping will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
- B. Clean non-potable domestic water piping as follows:
 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
- C. Prepare and submit reports of purging and disinfecting activities.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.7 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions to be provided and installed at all equipment connections and appurtenances.
- C. Under-building-slab, domestic water, building service and distribution piping, NPS 2 and smaller, shall be the following:
 1. Soft copper tube, ASTM B 88, Type K; (continuous, no joints under slab.)
- D. Under-building-slab, domestic water, building-service piping, NPS 2-1/2 and larger, shall be the following (see detail for additional requirements):
 1. Hard copper tube, ASTM B 88, Type K; wrought- copper brazed-joint fittings and joints.
 2. Mechanical-joint, ductile iron pipe; standard-pattern mechanical-joint fittings; and mechanical joints.
- E. Aboveground domestic water piping, all sizes, shall be the following:
 1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.
- F. Underfloor domestic water piping shall be the following:
 1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.
 2. Pre-insulated copper pipe. (Hot and Recirculated water only)

END OF SECTION 221116

SECTION 221119**DOMESTIC WATER PIPING SPECIALTIES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following domestic water piping specialties:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Balancing valves.
 - 5. Temperature-actuated water mixing valves.
 - 6. Strainers.
 - 7. Hose bibbs.
 - 8. Wall hydrants.
 - 9. Water hammer arresters (shock arrestors).
 - 10. Trap-seal primer valves.
 - 11. Flexible connectors.
 - 12. Drain Valves.

1.3 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers :
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Watts Industries, Inc.; Water Products Div.
 - e. Woodford Manufacturing Company.
 - f. Zurn Plumbing Products Group; Wilkins Div.
 2. Standard: ASSE 1001.
 3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 4. Body: Bronze.
 5. Inlet and Outlet Connections: Threaded.
 6. Finish: Mechanical areas: Rough bronze. Finished areas: Chrome
- B. Hose-Connection Vacuum Breakers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.
 - b. MIFAB, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Woodford Manufacturing Company.
 - e. Zurn Plumbing Products Group.
 2. Standard: ASSE 1011.
 3. Body: Bronze, non-removable, with manual drain.
 4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 5. Finish: Rough bronze.

2.2 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Watts Industries, Inc.; Water Products Div.
 - e. Zurn Plumbing Products Group; Wilkins Div.
 2. Standard: ASSE 1013.
 3. Operation: Continuous-pressure applications.
 4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.

5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
 6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 7. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
 - b. Strainer: Y-pattern with threaded ends on inlet of NPS 2 and smaller.
 - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
- B. Double-Check Backflow-Prevention Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Watts Industries, Inc.; Water Products Div.
 - e. Zurn Plumbing Products Group; Wilkins Div.
 2. Standard: ASSE 1015.
 3. Operation: Continuous-pressure applications, unless otherwise indicated.
 4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
 5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
 6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 7. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
- C. Pressure Type Backflow Preventers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Watts Industries, Inc.; Water Products Div.
 - e. Zurn Plumbing Products Group; Wilkins Div.
 2. Standard: ASSE 1052.
 3. Operation: Up to 10-foot head of water back pressure.
 4. Inlet Size: NPS 1/2 or NPS 3/4.
 5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.

2.3 WATER PRESSURE-REDUCING VALVES

- A. Water Regulators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Watts Industries, Inc.; Water Products Div.
 - e. Zurn Plumbing Products Group; Wilkins Div.
 2. Standard: ASSE 1003.

3. Pressure Rating: Initial working pressure of 150 psig.
4. Size: Service line size.
5. Design Outlet Pressure Setting: 70 psig.
6. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.4 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong International, Inc.
 - b. ITT Industries; Bell & Gossett Div.
 - c. NIBCO INC.
 - d. Taco, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
2. Type: Y-pattern globe valve with two readout ports and memory setting indicator.
3. Body: Bronze.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.5 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Armstrong International, Inc.
 - b. Lawler Manufacturing Company, Inc.
 - c. Leonard Valve Company.
 - d. Powers; a Watts Industries Co.
 - e. Symmons Industries, Inc.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.

6. Connections: Union inlets and outlet.
 7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
 8. Valve Pressure Rating: 125 psig minimum, unless otherwise indicated.
- B. Manifold, Thermostatic, Water-Mixing-Valve Assemblies:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Armstrong International, Inc.
 - b. Leonard Valve Company.
 - c. Powers; a Watts Industries Co.
 - d. Symmons Industries, Inc.
 2. Description: Factory-fabricated, thermostatically controlled, water-mixing-valve assembly in two or three-valve parallel arrangement.
 3. Large-Flow Parallel: Thermostatic water mixing valve and downstream pressure regulator with pressure gages on inlet and outlet.
 4. Intermediate-Flow Parallel: Thermostatic water mixing valve and downstream pressure regulator with pressure gages on inlet and outlet.
 5. Small-Flow Parallel: Thermostatic water mixing valve.
 6. Thermostatic Mixing Valves: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets and shutoff valve on outlet.
 7. Water Regulator(s): Comply with ASSE 1003. Include pressure gage on inlet and outlet.
 8. Component Pressure Ratings: 125 psig minimum, unless otherwise indicated.
 9. Cabinet (where indicated): Factory-fabricated, stainless steel, for recessed or surface mounting (per drawing indication) and with hinged, stainless-steel door.
 10. Performance characteristics and other requirements: Refer to drawings.
- C. Individual-Fixture, Water Tempering Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong International, Inc.
 - b. Lawler Manufacturing Company, Inc.
 - c. Leonard Valve Company.
 - d. Powers; a Watts Industries Co.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Plumbing Products Group; Wilkins Div.
 2. Standard: ASSE 1016, thermostatically controlled water tempering valve.
 3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
 4. Body: Bronze body with corrosion-resistant interior components.
 5. Temperature Control: Adjustable.
 6. Inlets and Outlet: Threaded.
 7. Finish: Rough or chrome-plated bronze.

2.6 STRAINERS FOR DOMESTIC WATER PIPING

- A. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
 2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
 3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 4. Screen: Stainless steel with round perforations, unless otherwise indicated.
 5. Perforation Size:

- a. Strainers NPS 2 and Smaller: 0.033 inch.
- b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.7 HOSE BIBBS

- A. Hose Bibbs:
1. Standard: ASME A112.18.1 for sediment faucets.
 2. Body Material: Bronze.
 3. Seat: Bronze, replaceable.
 4. Supply Connections: NPS 3/4 threaded -joint inlet.
 5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
 6. Pressure Rating: 125 psig.
 7. Vacuum Breaker: Integral, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
 8. Finish for Equipment Rooms: Rough bronze, or chrome plated.
 9. Finish for Service Areas: Rough bronze.
 10. Finish for Finished Rooms: Chrome plated.
 11. Operation for Equipment Rooms: Metal wheel handle or operating key.
 12. Operation for Service Areas: Metal wheel handle.
 13. Operation for Finished Rooms: Operating key.
 14. Include operating key with each operating-key hose bibb.
 15. Include integral wall flange with each chrome plated hose bibb.
 16. Other requirements: Refer drawing schedules and provide equivalency to model and manufacturer listed.

2.8 WALL HYDRANTS

- A. Nonfreeze Wall Hydrants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Watts Drainage Products Inc.
 - e. Woodford Manufacturing Company.
 - f. Zurn Plumbing Products Group.
 2. Standard: ASME A112.21.3M for self-draining wall hydrants.
 3. Pressure Rating: 125 psig.
 4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
 5. Inlet: NPS 3/4 or NPS 1.
 6. Other requirements: Refer drawing schedules and provide equivalency to model and manufacturer listed.
- B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Watts Drainage Products Inc.
 - d. Woodford Manufacturing Company.
 - e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Casings and Operating Rods: Of length required to match wall thickness. Include wall clamps.
5. Inlets: NPS 3/4 or NPS 1.
6. Vacuum Breaker: Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 and with garden-hose thread complying with ASME B1.20.7 on outlet.
7. Other requirements: Refer drawing schedules and provide equivalency to model and manufacturer listed.

2.9 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 600-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Bronze.
5. Ball: Stainless steel.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 WATER HAMMER ARRESTERS (SHOCK ARRESTORS)

A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. PPP Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.11 TRAP-SEAL PRIMER VALVES (TRAP PRIMERS)

A. Supply-Type, Trap-Seal Primer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. PPP Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Watts Industries, Inc.; Water Products Div.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.

5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
 6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
 7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
- B. Drainage-Type, Lavatory, Trap-Seal Primer Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
 3. Size: NPS 1-1/4 minimum.
 4. Material: Chrome-plated, cast brass.

2.12 TRAP-SEAL PRIMER SYSTEMS

- A. Trap-Seal Primer Systems:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings "Plumbing Fixture Schedule" or a comparable product by one of the following:
 - a. PPP Inc.
 2. Standard: ASSE 1044,
 3. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
 4. Cabinet: Recessed or Surface-mounting (per drawing indication) steel box with stainless-steel cover.
 5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
 6. Vacuum Breaker: ASSE 1001.
 7. Number Outlets: Refer to drawings.
 8. Size Outlets: NPS 1/2.

2.13 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flex-Hose Co., Inc.
 2. Metraflex, Inc.
- B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
1. Working-Pressure Rating: Minimum 200 psig.
 2. End Connections: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.\
 3. Install backflow preventers at 42-in above finished floor in an accessible location, preferably on a wall with galvanized steel channel and pipe strap support.
 4. Do not install bypass piping around backflow preventers.
 5. Provide and install threaded brass plugs for all test ports.
- B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.
- C. Install water-pressure-reducing valves downstream from shutoff valves.
- D. Install balancing valves in locations where they can easily be adjusted.
- E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
1. Install water mixing valves at 42-in above finished floor in an accessible location, preferably on a wall with galvanized steel channel and pipe strap support.
 2. Install thermometers and water regulators if specified.
 3. Install cabinet-type units recessed in or surface mounted on wall as specified.
- F. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve, solenoid valve, and pump.
- G. Install outlet boxes recessed in wall. Install 2-by-4-inch fire-retardant-treated-wood blocking wall reinforcement between studs. Fire-retardant-treated-wood blocking is specified in Division 06 Section "Rough Carpentry."
- H. Install water hammer arresters in water piping according to PDI-WH 201 and applicable drawing details.
- I. Install trap-seal primer valves without dedicated isolation valves; supply from nearest branch serving an occupant-use plumbing fixture. System style trap primer to have isolation valve.
- J. Install supply- and drainage-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- K. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow. Install unit at a minimum of 36" AFF.
- L. Provide and install a calibrated balancing valve in each hot-water circulation return loop. Verify that system flowrate is set and matches drawing requirements.

3.2 FLEXIBLE CONNECTOR INSTALLATION

- A. Install flexible connectors in suction and discharge manifold connections to each domestic water booster pump.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 - 1. Test and certify each backflow assembly according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.4 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.
- D. Open throttling valves to proper setting.
- E. Verify (by instrument flow testing) that auto-flow balancing valves in hot-water-circulation return piping are flowing specified gpm.
- F. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
- G. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
- H. Check plumbing specialties and verify proper settings, adjustments, and operation.

END OF SECTION 221119

SECTION 221316**SANITARY WASTE AND VENT PIPING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.3 DEFINITION

- A. Condensate Piping: Drainage piping that indirectly conveys clear-water condensate from air conditioning and refrigeration equipment to the sanitary drainage system.
- B. Indirect Drainage Piping: Piping that conveys waste water from mechanical equipment, including cooling towers, evaporative coolers, evaporative condensers, chilled-water systems, etcetera, to the sanitary drainage system.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. LLDPE: Linear, low-density polyethylene plastic.
- E. NBR: Acrylonitrile-butadiene rubber.
- F. PE: Polyethylene plastic.
- G. PVC: Polyvinyl chloride plastic.
- H. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.5 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency. Origin of product to be domestic. No imported product will be acceptable.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 and CISPI 301 and marked with the collective trademark of the CISPI and listed by NSF International.
- B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve. Coupling shall be listed by NSF International.
 - a. Manufacturers:
 - 1) ANACO.
 - 2) Fernco, Inc.
 - 3) Ideal Div.; Stant Corp.
 - 4) Mission Rubber Co.
 - 5) Tyler Pipe; Soil Pipe Div.
 - 2. Heavy-Duty, Shielded, Stainless-Steel Couplings: ASTM C 1540, with stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve. Coupling shall be listed by NSF International.
 - a. Manufacturers:
 - 1) ANACO.
 - 2) Clamp-All Corp.
 - 3) Ideal Div.; Stant Corp.
 - 4) Mission Rubber Co.
 - 5) Tyler Pipe; Soil Pipe Div.

2.4 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Extra-Heavy or Service class and marked with the collective trademark of the CISPI and listed by NSF International.
- B. Gaskets: ASTM C 564 and ASTM C 1563, rubber.
- C. Caulking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.5 STEEL PIPE AND FITTINGS

- A. Steel Pipe Nipples: ASTM A 53/A 53M, Type E or S, Grade A or B, Standard Weight or Schedule 40, galvanized. Include ends matching joining method.

2.6 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- B. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
- C. Soft Copper Tube: ASTM B 88, Types L, water tube, annealed temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2.7 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

2.8 PEX PIPING AND FITTINGS

- A. PEX Tubing: ASTM F876 & F877 Grade A.
 - 1. Redbrass Male Threaded Adapter
 - a. Manufacturers:
 - 1) Uponor Aqua Pex

2.9 SPECIAL PIPE FITTINGS

- A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers:
 - a. Dallas Specialty & Mfg. Co.
 - b. Fernco, Inc.
 - c. Logan Clay Products Company (The).
 - d. Mission Rubber Co.
 - e. NDS, Inc.

- f. Plastic Oddities, Inc.
- 2. Sleeve Materials:
 - a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers:
 - a. Cascade Waterworks Mfg. Co.
 - b. Mission Rubber Co.
- C. Flexible Ball Joints: Ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include gasketed ball-joint section and ductile-iron gland, rubber gasket, and steel bolts.
 - 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.
- D. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.
 - b. Romac Industries, Inc.
 - c. Star Pipe Products; Star Fittings Div.
- E. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - 1. Manufacturers:
 - a. SIGMA Corp.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Specification Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Flanges and unions shall be provided and installed at equipment connections and appurtenances.
- B. Indirect drainage piping for equipment connections shall be any of the following:
 - 1. Copper DWV tube, copper drainage fittings, and soldered joints
- C. Below-floor (crawl space), condensate drain and vent piping shall be any of the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
 3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- D. Above-floor, condensate drain and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 2. Copper DWV tube, copper drainage fittings, and soldered joints.
 3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- E. Underground, condensate drain and vent piping shall be any of the following:
1. Extra-Heavy class, cast-iron soil piping, hub and spigot; and gasketed joints.
 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
 3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- F. Below-floor (crawl space), soil, waste and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; heavy duty, shielded, stainless-steel couplings; and hubless-coupling joints. **(Required for use in Boiler Room, Kitchen and for Greasewaste)**
 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints. **(not permitted in Boiler Room, Kitchen or for Greasewaste)**
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- G. Above-floor, soil, waste and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 2. Galvanized steel nipples.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- H. Underground, soil, waste, vent piping shall be any of the following:
1. Extra-Heavy class, cast-iron soil piping, hub and spigot; and gasketed joints. **(Required for use in Boiler Room, Kitchen and for Greasewaste)**
 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints. **(Not permitted in Boiler Room, Kitchen or for Greasewaste)**
 3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- I. Above and below floor (crawl space), trap primer drainage piping shall be any of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.
 2. All piping in masonry block wall/chase to be wrapped in 6 mil poly-sleeve.
- J. Under-building-slab/in slab, trap primer drainage piping shall be any of the following:
1. Soft copper tube, ASTM B 88, Type L; cast- or wrought- copper brazed-joint fittings; and brazed joints.

2. PEX Tubing: ASTM F877 and F876, NSF Standard 14 and 61; brass fittings; No joints in slab (other than fixture connections).
3. All underslab/in-slab piping to be wrapped in 6 mil poly-sleeve.

K. Acid Waste and Vent Piping: Reference Acid Waste and Vent Piping Specification.

3.3 PIPING INSTALLATION

- A. Condensate shall be indirectly discharged into the sanitary drainage system through a 2-inch air gap (into a floor drain or hub drain) and shall not be directly connected (hard piped).
- B. Indirect drainage piping shall be discharged into the sanitary drainage system through a 2-inch air gap (into a floor or hub drain) and shall not be directly connected (hard piped).
- C. Provide clean outs as indicated on drawings and per local codes.
- D. Lead fittings are not acceptable.
- E. Sanitary sewer piping outside the building is specified in Specification Section "Sanitary Sewerage."
- F. Basic piping installation requirements are specified in Plumbing Specification Section "Basic Plumbing Materials and Methods."
- G. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Plumbing Specification Section "Basic Plumbing Materials and Methods."
- H. Install sleeves for all pipes passing through walls and concrete floors. **Refer to Plumbing Specification Section "Basic Plumbing Materials and Methods" for requirements.**
- I. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings." Lead fittings are not acceptable.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use fixture fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 135 degrees without the installation of a cleanout. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 1. Building Sanitary Drain: 2 percent downward in direction of flow for all piping.
 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

- M. Install engineered soil and waste drainage and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by engineer and authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Plumbing Specification Section "Basic Plumbing Materials and Methods."
- B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
- C. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- D. Solder Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 VALVE INSTALLATION

- A. Provide and install backwater valves in sanitary main entering the building where the top of the manhole is at a higher elevation than the finished floor of the first floor.
- B. Backwater Valves:
 - 1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
 - 2. Install backwater valves in accessible locations.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties. Contractor is responsible for coordination with all other trades.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
 - 5. Stainless steel flanges required at water fixture drain connection.

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of engineer and authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspections by engineer and authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Re-inspection: If engineer or authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by engineer and authorities having jurisdiction.
- D. Test sanitary drainage and vent piping as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. **Final Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Contractor shall introduce smoke into piping system continuously until the entire system has been approved by the engineer and the owner's representative.**
 - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 6. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221317**SANITARY WASTE AND VENT PIPING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.3 DEFINITION

- A. Condensate Piping: Drainage piping that indirectly conveys clear-water condensate from air conditioning and refrigeration equipment to the sanitary drainage system.
- B. Indirect Drainage Piping: Piping that conveys waste water from mechanical equipment, including cooling towers, evaporative coolers, evaporative condensers, chilled-water systems, etc., to the sanitary drainage system.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. LLDPE: Linear, low-density polyethylene plastic.
- E. NBR: Acrylonitrile-butadiene rubber.
- F. PE: Polyethylene plastic.
- G. PVC: Polyvinyl chloride plastic.
- H. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.5 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency. Origin of product to be domestic. No imported product will be acceptable.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 and CISPI 301 and marked with the collective trademark of the CISPI and listed by NSF International.
- B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve. Coupling shall be listed by NSF International.
 - a. Manufacturers:
 - 1) ANACO.
 - 2) Fernco, Inc.
 - 3) Ideal Div.; Stant Corp.
 - 4) Mission Rubber Co.
 - 5) Tyler Pipe; Soil Pipe Div.
 - 2. Heavy-Duty, Shielded, Stainless-Steel Couplings: ASTM C 1540, with stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve. Coupling shall be listed by NSF International.
 - a. Manufacturers:
 - 1) ANACO.
 - 2) Clamp-All Corp.
 - 3) Ideal Div.; Stant Corp.
 - 4) Mission Rubber Co.
 - 5) Tyler Pipe; Soil Pipe Div.

2.4 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Extra-Heavy or Service class and marked with the collective trademark of the CISPI and listed by NSF International.
- B. Gaskets: ASTM C 564 and ASTM C 1563, rubber.
- C. Caulking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.5 STEEL PIPE AND FITTINGS

- A. Steel Pipe Nipples: ASTM A 53/A 53M, Type E or S, Grade A or B, Standard Weight or Schedule 40, galvanized. Include ends matching joining method.

2.6 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- B. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
- C. Soft Copper Tube: ASTM B 88, Types L, water tube, annealed temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2.7 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

2.8 PEX PIPING AND FITTINGS

- A. PEX Tubing: ASTM F876 & F877 Grade A.
 - 1. Redbrass Male Threaded Adapter
 - a. Manufacturers:
 - 1) Uponor Aqua Pex

2.9 SPECIAL PIPE FITTINGS

- A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers:
 - a. Dallas Specialty & Mfg. Co.
 - b. Fernco, Inc.
 - c. Logan Clay Products Company (The).
 - d. Mission Rubber Co.
 - e. NDS, Inc.

- f. Plastic Oddities, Inc.
- 2. Sleeve Materials:
 - a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers:
 - a. Cascade Waterworks Mfg. Co.
 - b. Mission Rubber Co.
- C. Flexible Ball Joints: Ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include gasketed ball-joint section and ductile-iron gland, rubber gasket, and steel bolts.
 - 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.
- D. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.
 - b. Romac Industries, Inc.
 - c. Star Pipe Products; Star Fittings Div.
- E. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - 1. Manufacturers:
 - a. SIGMA Corp.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Specification Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Flanges and unions shall be provided and installed at equipment connections and appurtenances.
- B. Indirect drainage piping for equipment connections shall be any of the following:
 - 1. Copper DWV tube, copper drainage fittings, and soldered joints
- C. Below-floor (crawl space), condensate drain and vent piping shall be any of the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
 3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- D. Above-floor, condensate drain and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- E. Underground, condensate drain and vent piping shall be any of the following:
1. Extra-Heavy class, cast-iron soil piping, hub and spigot; and gasketed joints.
 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
 3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- F. Below-floor (crawl space), soil, waste and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; heavy duty, shielded, stainless-steel couplings; and hubless-coupling joints. **(Required for use in Boiler Room, Kitchen and for Greasewaste)**
 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints. **(not permitted in Boiler Room, Kitchen or for Greasewaste)**
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- G. Above-floor, soil, waste and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 2. Galvanized steel nipples.
 3. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints. **(All locations, however, in Kitchens, PVC permitted above drain connection only)**
 4. Copper DWV tube, copper drainage fittings, and soldered joints.
 5. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- H. Underground, soil, waste, vent piping shall be any of the following:
1. Extra-Heavy class, cast-iron soil piping, hub and spigot; and gasketed joints. **(Required for use in Boiler Room, Kitchen and for Greasewaste)**
 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints. **(Not permitted in Boiler Room, Kitchen or for Greasewaste)**
 3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- I. Above and below floor (crawl space), trap primer drainage piping shall be any of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.
 2. PEX Tubing: ASTM F877 and F876, NSF Standard 14 and 61; brass fittings; No joints in slab (other than fixture connections).

3. All underslab piping to be wrapped in 6 mil poly-sleeve.
- J. Under-building-slab, trap primer drainage piping shall be any of the following:
 1. Soft copper tube, ASTM B 88, Type L; cast- or wrought- copper brazed-joint fittings; and brazed joints.
- K. Acid Waste and Vent Piping: Reference Acid Waste and Vent Piping Specification.

3.3 PIPING INSTALLATION

- A. Condensate shall be indirectly discharged into the sanitary drainage system through a 2-inch air gap (into a floor drain or hub drain) and shall not be directly connected (hard piped).
- B. Indirect drainage piping shall be discharged into the sanitary drainage system through a 2-inch air gap (into a floor or hub drain) and shall not be directly connected (hard piped).
- C. Provide clean outs as indicated on drawings and per local codes.
- D. Lead fittings are not acceptable.
- E. Sanitary sewer piping outside the building is specified in Specification Section "Sanitary Sewerage."
- F. Basic piping installation requirements are specified in Plumbing Specification Section "Basic Plumbing Materials and Methods."
- G. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Plumbing Specification Section "Basic Plumbing Materials and Methods."
- H. Install sleeves for all pipes passing through walls and concrete floors. **Refer to Plumbing Specification Section "Basic Plumbing Materials and Methods" for requirements.**
- I. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings." Lead fittings are not acceptable.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use fixture fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 135 degrees without the installation of a cleanout. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 1. Building Sanitary Drain: 2 percent downward in direction of flow for all piping.

2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install engineered soil and waste drainage and vent piping systems as follows:
1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by engineer and authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Plumbing Specification Section "Basic Plumbing Materials and Methods."
- B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
- C. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- D. Solder Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 VALVE INSTALLATION

- A. Provide and install backwater valves in sanitary main entering the building where the top of the manhole is at a higher elevation than the finished floor of the first floor.
- B. Backwater Valves:
1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
 2. Install backwater valves in accessible locations.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties. Contractor is responsible for coordination with all other trades.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
 5. Stainless steel flanges required at water fixture drain connection.

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of engineer and authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspections by engineer and authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Re-inspection: If engineer or authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by engineer and authorities having jurisdiction.
- D. Test sanitary drainage and vent piping as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 6. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221317

SECTION 221319

DRAIN PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Miscellaneous sanitary drainage piping specialties.
 - 4. Miscellaneous storm drainage piping specialties. interceptors.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases for outdoor cleanouts.
- B. Coordinate size and location of roof penetrations and flashing requirements with architectural.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

- A. **All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner's Representative prior to bidding may be furnished.**
- B. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.

2.2 CLEANOUTS

- A. Exposed Metal Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
 2. Standard: ASME A112.36.2M for cast iron cleanout test tee.
 3. Size: Same as connected drainage piping
 4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
 5. Closure: Countersunk or raised-head, brass plug.
 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Metal Floor Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Tyler Pipe; Wade Div.
 - d. Watts Drainage Products Inc.
 - e. Zurn Plumbing Products Group; Light Commercial Operation.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
 2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
 3. Size: Same as connected branch.
 4. Type: Threaded, adjustable housing.
 5. Body or Ferrule: Cast iron.
 6. Clamping Device: Not required.
 7. Outlet Connection: Spigot.
 8. Closure: Brass plug with straight threads and gasket.
 9. Adjustable Housing Material: Cast iron with threads.
 10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
 11. Frame and Cover Shape: Round.
 12. Top Loading Classification: Heavy Duty.
 13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
 14. Standard: ASME A112.3.1.

15. Size: Same as connected branch.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
5. Closure: Countersunk, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

2.3 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on the drawing "Floor Drain Schedule" or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Light Commercial Operation.
 - g. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.3.
3. Seepage Flange: Required.
4. Anchor Flange: Required.
5. Outlet: Bottom.
6. Backwater Valve: Not required.
7. Trap Pattern: Standard P-trap, unless otherwise indicated.
8. Other Requirements: Refer to drawing schedule and provide full model equivalency.

2.4 ROOF FLASHING ASSEMBLIES

- A. Roof Flashing Assemblies: Refer to architectural drawings and specifications for requirements.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

2.6 SOLIDS INTERCEPTORS

A. Solids Interceptors:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings "Plumbing Fixture Schedule" or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Type: Factory-fabricated interceptor made for removing and retaining sediment from wastewater.
3. Body Material: Cast iron or steel.
4. Interior Lining: Corrosion-resistant enamel.
5. Exterior Coating: Corrosion-resistant enamel.
6. End Connections: Threaded.
7. Other Requirements: Refer to drawing schedule and provide full model equivalency.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Plumbing Specification Section "Basic Plumbing Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Provide and install cleanouts (in addition to those indicated on the drawings) in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 135 degrees.
 3. Locate at maximum intervals of 50 feet for piping.
 4. Locate at base of each vertical soil and waste stack.
 5. Locate one cleanout for each restroom.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame anchored to reinforcement or studs and cover flush with finished wall.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 1. Position floor drains for easy access and maintenance.

2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to architectural requirements.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install roof flashing assemblies on roof drains, sanitary stack vents and vent stacks that extend through roof.
- G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- H. Assemble open drain fittings and install with top of hub 2 inches above floor.
- I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.
 3. Connection to floor drain body is not acceptable.
- J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- K. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.
- L. Install reinforcement for wall-mounting-type specialties.
- M. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Plumbing Specification Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

- A. Refer to architectural roofing drawings and specifications for requirements.
- B. Install flashing for piping passing through roofs with counter-flashing or commercially made flashing fittings, according to Specification Section "Sheet Metal Flashing and Trim."
- C. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- D. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.

- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 223300

ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following electric water heaters:
 - 1. Commercial, storage electric water heaters.
 - 2. Compression expansion tanks.
 - 3. Water heater accessories.

1.3 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories. Submitted product to match specified/scheduled equipment including all options and appurtenances, in addition to specifications.
- B. Specification Compliance Review:
 - 1. Manufacturers and bidders must provide the consulting engineer with a Compliance Review of the Specifications and Addenda's. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications and schedule with the following information "C", "D", or "E" marked in the margin of the original Specifications and any subsequent Addenda's. If the manufacturer or bidder does not provide the Compliance Review to the engineer for review, with the submittal, the submittal will be subject to rejection as non-compliant.
 - a. "C" Comply with no exceptions.
 - b. "D" Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
 - c. "E" Exception do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives. Non-compliance with the specifications is grounds for rejection as unacceptable. A bid from any alternative or listed equipment manufacturer with any number of exceptions will be reason for rejection for non-compliance without further review.
 - d. Unless a deviation or exception is specifically noted in the Compliance Review, the manufacturer shall provide full compliance with entire specification. Deviations or exceptions taken in letters or cover letters in a bid document, subsidiary documents, by omission or by contradiction do not release the manufacturer or bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review and approved by the consulting engineer.
 - e. Equipment manufacturers or bidders that do not meet the specifications thru the above process will be subject to rejection without further review.

- C. Shop Drawings: Diagram power, signal, and control wiring.
- D. Product Certificates: For each type of commercial electric water heater, signed by product manufacturer.
 - 1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Source quality-control test reports.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.
- H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.
- F. Origin of product to be domestic, no imported products will be acceptable.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period(s): From date of Substantial Completion:
 - a. Commercial Electric Water Heaters:
 - 1) Storage Tank: Six (6) years.
 - 2) Controls and Other Components: Three (3) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 COMMERCIAL ELECTRIC WATER HEATERS (50 THROUGH 120 GALLON)

- A. Commercial, Storage Electric Water Heaters: Comply with UL 1453 requirements for storage-tank-type water heaters.
 1. Manufacturers:
 - a. Rheem Water Heater Div.; Rheem Manufacturing Company.
 - b. Smith, A. O. Water Products Company.
 2. Storage-Tank Construction: steel vertical arrangement.
 - a. Tappings: 1-½" NPT factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
 - b. Pressure Rating: 150 psig.
 - c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings; high temperature porcelain enamel.
 - d. ASME rated tank per ASME Boiler and Pressure Vessel Code, Section IV Part HLW if specified on schedule.
 3. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium; two (2) anodes per tank.
 - b. Drain Valve: ¾", ¼ turn bronze ball valve, stainless steel ball and trim. ¾" hose thread adaptor and cap.
 - c. Insulation: Comply with ASHRAE/IESNA 90.1; 3" rigid polyurethane foam insulation, non-CFC.
 - d. Jacket: Steel with enameled finish.
 - e. Heating Elements: Electric, screw-in immersion type; stainless steel. Minimum of two (2) elements.
 - 1) Staging: Input not exceeding 18 kW per step.
 - f. Temperature Control: Adjustable thermostat. (Non-ASME: Surface mounted, ASME: Immersion type)
 - g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
 - h. Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3, for combination temperature and pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
 4. Special Requirements: NSF 5 construction.
 5. Capacity and Characteristics: Refer to drawing schedule.

2.3 COMPRESSION EXPANSION TANKS

- A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air pre-charge to minimum system-operating pressure at tank.
 - 1. Manufacturers:
 - a. Smith, A. O.; Aqua-Air Div.
 - b. Rheem Water Heater Div.
 - 2. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
 - b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
 - 3. Capacity and Characteristics:
 - a. Working-Pressure Rating: 150 psig.
 - b. Capacity Acceptable: Refer to drawings.
 - c. Air Precharge Pressure: Refer to drawings.

2.4 WATER HEATER ACCESSORIES

- A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- B. Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include pressure setting less than water heater working-pressure rating.
- C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.
- D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.
- E. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig maximum outlet pressure, unless otherwise indicated.

2.5 SOURCE QUALITY CONTROL

- A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial water heater storage tanks before shipment to minimum of one and one-half times pressure rating.
- C. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

- A. Install commercial water heaters on concrete bases.
 - 1. Concrete base construction requirements are specified in Specification Section "Basic Plumbing Materials and Methods."
- B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Extend commercial-water-heater relief-valve outlet, with drain piping of same material as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains with drain piping of same material as domestic water piping.
- E. Install thermometer on outlet piping of water heaters. Refer to Specification Section "Meters and Gauges" for thermometers.
- F. Install pressure gage(s) on outlet of commercial electric water- heater piping. Refer to Specification Section "Meters and Gauges" for pressure gages.
- G. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- H. Fill water heaters with water.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other plumbing and mechanical Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install water heater and piping adjacent to heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.
- C. Ground equipment according to Specification Section "Grounding and Bonding."
- D. Connect wiring according to Specification Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.

- 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 1 Section "Closeout Procedures" or "Demonstration and Training."

END OF SECTION 223300

SECTION 224100
PLUMBING FIXTURES

PART 1 - GENERAL

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


















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PART 2 - PRODUCTS

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-b -Design manufacturer and model number listed on the drawing "Plumbing Fixture Schedule" for additional features, construction details, accessories and/or options.

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A. All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner s Representative prior to bidding may be furnished.

B and equipment shall be installed in accordance with the manufacturer's

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Figure 2. **A** Schematic representation of the experimental design. **B** Schematic representation of the experimental design.

PLUMBING FIXTURES
224100
05/05/2021

Q - 6/2

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1. listed on the drawing "Plumbing Fixture Schedule."
 2. a. b. c.

PART 3 - EXECUTION

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CONSTRUCTION DOCUMENTS
SPECIFICATIONS
ISSUED FOR CONSTRUCTION

CAMINO REAL WORK FORCE CTR
RENOVATION & EXPANSION PROJ.

PLUMBING FIXTURES
224100
05/05/2021

| | | | | |
|---|----|----|----|----|
| F | R | -a | -a | in |
| G | -a | -a | -a | -a |
| 6 | B | | | |
| A | 1 | 2 | -a | -a |
| B | -a | -a | -a | -a |
| 3 | B | | | |
| A | -a | -a | -a | -a |
| B | -a | -a | -a | -a |

END OF SECTION 224100

SECTION 31 00 00
EARTHWORK

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 this Section.
- B. Division 03 Section 30 00 "Cast-In-Place Concrete" for encasings, cradles, and appurtenances for utility systems.
- C. Division 31 Section 10 00 "Site Clearing" for site stripping, grubbing, topsoil removal and tree protection.
- D. Division 31 Section 22 13 "Rough Grading" for grading and rough contour site.
- E. Division 31 Section 23 16 "Excavation" for building foundations.
- F. Division 31 Section 23 23.13 "Backfill" to sub-grade elevations.
- G. Division 31 Section 23 33 "Trenching and Backfilling"

1.02 SUMMARY

- A. Contractor shall furnish all labor, materials, equipment and incidentals as shown, specified and necessary to complete the work of site preparation, erosion control, surface drainage, subsurface drainage, ground water control, construction of compacted fills, excavation, installation and removal of sheeting and bracing, backfilling and final site grading, including underfloor areas.
- B. Contractor shall provide all backfill materials, including select backfill, crushed stone, backfill, clay, granular embedment, topsoil, porous granular fill and the satisfactory disposal of surplus and unacceptable materials.
- C. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof.
- D. Contractor shall perform all earthwork, including backfilling all demolition areas.

1.03 DEFINITIONS

- A. Excavation: Consists of the removal of material encountered to sub-grade elevations and the reuse or disposal of materials removed.
- B. Sub-grade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- D. Sub-base Course: The layer placed between the sub-grade and base course in a paving system or the layer placed between the sub-grade and surface of a pavement or walk.
- E. Flexible Base Course: The layer placed between the sub-base and surface pavement in a paving system.
- F. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.
- G. Unauthorized Excavation: Consists of removing materials beyond indicated sub-grade elevations or dimensions without direction by the Project Architect/Engineer. Unauthorized excavation, as well as remedial work directed by the Architect/Engineer, shall be at the Contractor's expense.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- I. Utilities: Include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.04 COORDINATION

- A. The Contractor shall expedite placement of compacted fills and embankments as per the

Project Schedule.

1.05 PROJECT CONDITIONS

- A. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active. All existing underground utilities within the areas of buildings must be removed.

1.06 SOURCES OF MATERIALS

- A. Fill materials for backfill and site grading may be obtained from on-site excavation work and/or obtained by the Contractor from off-site sources at Contractor's expense.
- B. Select backfill (Flexible Base) materials shall be obtained by the Contractor from off-site sources at Contractor's expense.
- C. Topsoil, except for topsoil stripped from the new work areas that meets the specific requirements for this material, shall be obtained by the Contractor from off-site sources at Contractor's expense. Reference Landscape plans.
- D. Granular embedment materials shall be obtained by the Contractor from off-site sources at Contractor's expense.
- E. Crushed stone fill materials shall be obtained by the Contractor from off-site sources at Contractor's expense.
- F. Porous granular fill shall be obtained by the Contractor from off-site sources at Contractor's expense.
- G. Pit run sand shall be obtained by the Contractor from off-site sources at Contractor's own expense.
- H. Clay materials for backfill shall be obtained from on-site excavation work and/or obtained by the Contractor from offsite sources at Contractor's expense.

1.07 QUALITY ASSURANCE

- A. Owner will employ a Testing Laboratory to perform Soil Testing and Inspection Service for quality control testing during grading and excavation operations.

1.08 TESTING SERVICES

- A. The testing of products: Testing for moisture content during placement and compaction of fill materials, and of compaction requirements for compliance with technical requirements of the Specifications shall be performed by the testing laboratory as designated in Section 01 40 00.
- B. Testing Agency shall:
 - 1. Test the Contractor's proposed materials in the laboratory and/or field for compliance with the Specifications.
 - 2. Perform field moisture content and density tests to assure that the specified compaction of backfill materials has been obtained.
 - 3. Report all test results to the Owner, Project Architect/Engineer and the Contractor.
- C. Authority and Duties of Testing Agency: Technicians representing the testing laboratory shall inspect the materials in the field and perform tests, and shall report their findings to the Owner, Project Architect/Engineer and the Contractor. When the materials furnished or Work performed fails to fulfill Specifications requirements, the technician will direct the attention of the Owner, Project Architect/Engineer and the Contractor to such failure.
- D. Technicians representing the Testing Agency: Shall not act as foreman or perform other duties for the Contractor. Work will be checked as it progresses, but failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Project Architect/Engineer for final acceptance. Technicians are not authorized to revoke, alter, relax, enlarge, or release any requirements of the Specifications, nor to approve or accept any portion of the Work.
- E. Responsibilities and Duties of the Contractor: The use of testing services shall in no way relieve the Contractor of his responsibility to furnish materials and construction in full compliance with the Drawings and Specifications.
 - 1. Contractor shall secure and deliver to the testing agency, without cost, preliminary representative samples of the materials he proposes to use and which are required to be tested.

2. Contractor shall furnish such casual labor as is necessary to obtain and handle samples at the Project or at other sources of material.
3. Contractor shall advise the Owner and the Testing Agency sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.

1.09 REFERENCE STANDARDS: The Contractor shall comply with applicable provisions and recommendations of the following:

- A. ASTM A 36, Structural Steel.
- B. ASTM A 328, Steel Sheet Piling.
- C. ASTM D 422, Particle-Size Analysis of Soils.
- D. ASTM D 423, Liquid Limit of Soils.
- E. ASTM D 427, Shrinkage Factors of Soils.
- F. ASTM D 698 Moisture-Density Relations of Soils, using 5.5 lb Rammer and 12-in drop.
- G. ASTM D 4318 Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
- H. ASTM D 1140, Amount of Material in Soils Finer than the No. 200 Sieve.
- I. ASTM D 1556, Density of Soil in Place by the Sand-Cone Method.
- J. ASTM D 1557, Moisture-Density Relations of Soils, using 10.0 lb (4.5 kg) Rammer and 18- in. Drop.
- K. ASTM D 2166, Unconfined Compressive Strength of Cohesive Soil.

1.10 SUBMITTALS

- A. Should sheet and shoring be necessary, the Contractor shall prepare Drawings for the following: Sheeting and bracing for excavations over 5 feet deep. The Drawings shall be prepared by a Professional Engineer licensed in the State of Texas. The Drawings shall be submitted to the Project Architect/Engineer for establishing that the terms of the Specifications are complied with. Calculations shall not be submitted. Drawing submissions will not be checked and will not imply approval by the Project Architect/Engineer of the Work involved. The Contractor shall be wholly responsible for designing, installing and operating whatever system is necessary to accomplish satisfactory sheeting, bracing, dewatering, and protection.
- B. Test Reports: Testing Laboratory shall submit copies of the following reports directly to the Owner, Project Architect/Engineer and Contractor:
 1. Pavement sub-grade.
 2. Field density tests.
 3. Optimum moisture - maximum density curve for each soil used for backfill.
 4. Tests of actual unconfined compressive strength or bearing test of each strata.
- C. Samples of all select backfill, backfill, flowable fill, clay, drainage material, granular embedment, porous granular fill, pit run sand and topsoil shall be submitted by the Contractor to the testing laboratory. Samples of the proposed material shall be submitted at least fourteen days in advance of its anticipated use.

1.11 SITE CONDITIONS

- A. Geotechnical Information: A Geotechnical Investigation has been performed for the Owner by others. This report is available for review by Bidders. The Owner makes no warranty or representation as to the accuracy of said report. Bidders are encouraged to perform their own tests and draw their own conclusions from those tests before submitting bids. Owner is not responsible for Bidders' conclusions which result from the Geotechnical information found in the Owner's report.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Backfill and Fill Materials:
 1. Materials acceptable for use as backfill or fill shall be materials obtained from excavations on site or from off-site sources whose gradation shows not more than 15 percent passing the No. 200 standard sieve as determined by ASTM D 1140, and whose Plasticity Index is not in excess of 20 percent as determined by ASTM D 4318. The material shall contain

- no vegetative matter.
2. All material for use as backfill and fill shall be tested by the testing laboratory and approved by the Project Architect/Engineer.

B. Select Backfill (Flexible Base - Base Material):

1. Select backfill for compaction backfill shall conform to the 2014 Texas Department of Transportation Standard Specifications Items 247 gradation Type A, Grades 1 or 2 as follows:

| Sieve Size | Percent Retained on Sieve |
|-------------|------------------------------|
| 2 – ½" inch | 0 |
| 1 – ¾" inch | 0-10 |
| No. 4 | 45 - 75 |
| No. 40 | 60 - 85 |

2. The select backfill mixture shall contain no clay lumps or organic matter. The fraction passing No. 40 sieve shall have a liquid limit not greater than 40 and a plasticity index between 7 and 15 as determined by ASTM D 424. The select backfill shall be deposited in uniform layers not exceeding 8 inches in uncompacted thickness. The backfill shall be compacted by a suitable vibratory roller or platform vibrator to not less than 95 percent of laboratory maximum density as determined by ASTM D 1557, unless otherwise noted on plans.

- C. Granular embedment material shall be crushed rock or pea gravel with not less than 95 percent passing a ½-inch sieve and not less than 95 percent retained on a No. 4 sieve.

- D. Crushed stone shall be crushed rock conforming to the following gradation:

| Sieve Size | Percent Retained on Sieve |
|------------|------------------------------|
| 3 inch | 0 |
| 2-1/2 inch | 0 -10% |
| 2 inch | 30 - 65% |
| 1-1/2 inch | 85 - 100% |
| 3/4 inch | 95 - 100% |

E. Porous Granular Fill:

1. Porous granular fill for compaction backfill shall conform to the following:

| Sieve Size | Percent Retained on Sieve |
|------------|------------------------------|
| 1-3/4 inch | 0% - 10% |
| No. 4 | 45% - 75% |
| No. 40 | 60% - 85% |
| No. 200 | 90% - 100% |

2. The porous granular fill material shall contain no clay lumps or organic matter. The fraction passing the No. 40 sieve shall be non-plastic. The porous granular fill shall be deposited in uniform layers not to exceed 6 inches in uncompacted thickness. The backfill shall be compacted to not less than 100% of the laboratory maximum density as determined by ASTM D-1557.
3. All material for porous granular fill must be tested by the testing laboratory and approved by the Project Architect/Engineer.
4. No porous granular fill shall be placed without the Project Architect/Engineer's approval.

F. Pit Run Sand:

1. Pit run sand for compaction backfill for use as shown conform to the following:

| Sieve Size | Percent Retained on Sieve |
|------------|------------------------------|
| No. 4 | 0 |
| No. 200 | 90 - 100% |

2. Pit run sand material shall contain no organic material. The maximum plastic limit of the material shall be less than 10. The pit run sand shall be deposited in uniform layers not to exceed 8 inches in uncompacted thickness. The backfill shall be compacted to not less than 95% of laboratory maximum density as determined by ASTM-D-698.
3. All material for pit run sand must be tested by the testing laboratory and approved by the Project Architect/Engineer.
4. No pit run sand shall be placed without the approval of the Project Architect/Engineer

G. Clay

1. Material for use as clay liner over top of backfill and/or select backfill or as otherwise shown shall conform to the following:

| Sieve Size | Percent Retained on Sieve |
|------------|------------------------------|
| No. 4 | 0 - 15% |
| No. 200 | 30 - 100% |

2. The minimum plastic limit shall be 25. Clay shall be deposited in uniform layers not to exceed 8 inches in uncompacted thickness. The clay shall be compacted to not less than 95% of maximum density as determined by ASTM D- 698.
3. All material for clay must be tested by the testing laboratory and approved by the Project Architect/Engineer.
4. No clay shall be placed without the approval of the Project Architect/Engineer.

H. Drainage Material:

1. Drainage material for use as shown on the Drawings shall conform to the following:

| Sieve Size | Percent Retained on Sieve |
|------------|------------------------------|
| 2 inch | 0% |
| 1-1/2 inch | 0 - 10% |
| 1 inch | 45 - 75% |
| 3/4 inch | 90 - 100% |
| 1/2 inch | 95 - 100% |

2. The drainage material shall be crushed rock. The drainage material shall be compacted by two passes of a hand activated vibratory compactor. The material shall have a LA abrasion number of 35 or less.
3. All drainage material must be tested by the testing laboratory and approved by the Project Architect/Engineer.
4. No drainage material shall be placed without the Project Architect/Engineer approval.

I. Accessories:

1. Detectable Warning Tape: Acid-and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, six (6) inches wide and four (4) mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep. Detectable Warning Tape to be used on all PVC piping except perforated subsurface piping.
 - a) Tape Colors: Provide tape colors to utilities as follows:
 - (1) Red: Electric.
 - (2) Yellow: Gas, oil, steam, and dangerous materials.
 - (3) Orange: Telephone and other communications.
 - (4) Blue: Water systems.
 - (5) Green: Sewer systems.
 - (6) Brown: Force mains
2. Filter Fabric: Manufacturer's standard nonwoven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.
3. Provide Filter Fabrics: That meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:

- a) Grab Ensil Strength (ASTM D 4632): 100 lb.
- b) Apparent Opening Size (ASTM D 4751): #100 U.S. Standard Sieve.
- c) Permeability (ASTM D 4491): 150 gallons per minute per sq. ft.

PART 3 - EXECUTION

3.01 SITE PREPARATION

- A. The portions of the site on which the Work is to be constructed shall be cleared of all objectionable materials and debris (see Section 31 10 00, Site Clearing). Trees within the project limits except those indicated in Drawings to remain shall be completely removed, including stumps and roots. All materials and debris shall be disposed off site in accordance with applicable regulations.

3.02 STRIPPING AND STORING OF TOPSOIL

- A. Those portions of the site on which the new Work is to be constructed shall be stripped of all topsoil to a minimum depth of 6 inches prior to other earthwork operations. Stripped materials shall not be used for compacted fill.
- B. The stripped topsoil shall be stockpiled at the place or places approved by the Project Architect/Engineer.
- C. Topsoil to be suitable for re-use shall meet the requirements for topsoil described by Landscape Architect/Engineer above, and shall be free from trash, debris, and surface vegetation.
- D. After all of the other Work has been completed in each area, topsoil shall be placed and graded in accordance with the Grading Plan and as specified in the Landscape Drawings and Specifications.

3.03 EROSION CONTROL AND DEWATERING

- A. In general, the construction procedures outlined herein shall be implemented to ensure minimum damage to the environment during construction.
- B. Whenever possible, access and temporary roads shall be located and constructed to avoid environmental damage. Provisions will be made to regulate drainage, avoid erosion and minimize damage to vegetation.
- C. Where areas must be cleared for storage of materials or temporary structures, provisions shall be made for regulating drainage and controlling erosion, subject to Project Architect/Engineer approval.
- D. Temporary measures shall be applied to control erosion and to minimize the siltation of the project site and adjacent property. Such measures shall include, but not be limited to, the use of silt fences, berms, baled straw silt barriers, gravel or crushed stone, mulch, grasses, slope drains and other methods. These temporary measures shall be applied to erodible materials exposed by any activities associated with the construction of this Project.
 - 1. Special care shall be taken to eliminate depressions that could serve as mosquito pools.
 - 2. Temporary measures shall be coordinated with the construction of permanent drainage facilities and other Work to the extent practicable to assure economical, effective, and continuous erosion and siltation control.
 - 3. Contractor shall provide special care in areas with steep slopes. Disturbance of vegetation shall be kept to a minimum to maintain stability.
- E. Remove only those trees, shrubs and grasses indicated in the Drawings as such. Protect the rest to preserve their aesthetic and erosion-control values.
- F. Install erosion and sediment control practices according to soil conservation district standards and specifications. The practices shall be maintained in effective working condition during construction and until the drainage area has been permanently stabilized.
- G. In the event of any temporary work stoppage, the Contractor shall take steps to prevent any temporary or permanent environmental damage to the area undergoing construction.
- H. In the event the Contractor fails to satisfactorily control erosion and siltation, the Owner reserves the right to employ outside assistance or to use its own forces to provide the corrective measures indicated. The cost of such Work, plus engineering costs, will be deducted from

monies due the Contractor.

- I. Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the Work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein is inspected by the Project Architect/Engineer and backfill operations have been completed and approved.
 1. The different working areas on the site shall be kept free of surface water at all times. The Contractor shall install drainage ditches and dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations and fill areas. The diversion and removal of surface water shall be performed in a manner that will prevent the accumulation of water behind temporary structures or at any other locations within the construction area where it may be detrimental.
 2. The Contractor will be held responsible for the condition of any pipe, conduit or channel which he may use for drainage purposes and all such pipes, conduits or channels shall be left clean and free of sediment.
- J. Refer to Article 3.19 of this Section for the TPDES General Permit requirements.

3.04 EXCAVATION

- A. Contractor shall excavate and backfill in advance of the construction, test pits to determine conditions or location of the existing utilities. Contractor shall perform all Work required in connection with excavating, stockpiling, maintaining, sheeting, shoring, backfilling and replacing pavement for the test pits.
- B. Contractor shall be responsible for the definite location of each existing utility involved within the area of his excavation for Work under this Contract. Care shall be exercised during such location work to avoid damaging and/or disrupting the affected utility. The Contractor shall be responsible for repairing, at his expense, damage to any structure, piping or utility caused by his Work.
- C. Explosives will not be permitted on this project.
- D. Contractor and/or Contractor's independently retained employee or structural design/geotechnical/safety/equipment consultant, if any, shall review the Drawings and any available geotechnical information and the anticipated installation site(s) within the project Work area in order to develop the Contractor's plans to implement the project described in the Contract Documents. The Contractor's plans shall provide for adequate trench safety systems that comply with, as a minimum, OSHA standards for trench excavations. Specifically, Contractor and/or Contractor's independently retained employee or safety consultant shall develop and implement a trench safety program in accordance with OSHA standards governing the presence and activities of individuals working in and around trench excavation. Contractor shall be required to provide an on-site representative to insure compliance and review of the trench safety program. Contractor shall be required throughout the construction process to insure that the appropriate safety system(s) is utilized for the soil condition encountered during the construction of the project.
- E. Sheeting and shoring shall be provided as necessary for the protection of the Work and for the safety of personnel. The clearances and types of the temporary structures, insofar as they affect the character of the finished work, will be subject to the approval of the Project Architect/Engineer, but the Contractor shall be responsible for the adequacy of all sheeting, bracing, cofferdamming, etc. No separate payment is to be made for providing or removing steel or wood sheet piling; payment shall be considered as having been included in the price bid for the Contract. All shoring, bracing and sheeting shall be removed as the excavations are backfilled and in a manner such as to prevent injurious caving; or, if so directed by the Project Architect/Engineer, because in his opinion, removal would be damaging to structures or personnel, shall be left in place. Sheeting left in place shall be cut off 3 feet below the surface. Payment for sheeting left in place shall be considered as having been included in the Contract Price. All sheeting and bracing must be maintained until replaced by other sheeting and bracing or until the

permanent construction is able to withstand lateral pressures from soil and water. Remove sheeting and bracing from excavations unless otherwise ordered in writing by the Project Architect/Engineer. Removal shall be done so as to not cause injury to the Work. Removal shall be equal on both sides of excavations to ensure no unequal loads on pipe or structure. Defer removal of sheeting and bracing, where removal may cause soil to come into contact with concrete until the following conditions are satisfied:

1. Concrete has cured a minimum of 7 days.
 2. Wall and floor framing up to and including grade level floors are in place.
- F. Excavation of every description and of whatever substances encountered within the grading limits of the Project shall be performed to the lines and grades indicated on the Drawings. All excavation shall be performed in the manner and sequence as required for the Work.
1. Excavation Work shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards. Excavations shall provide adequate working space and clearances for the Work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.
 2. Slope sides of open excavations to a slope of two horizontal to one vertical.
 3. Subgrades for parking areas and trench bottoms shall be firm, dense, and thoroughly compacted to a 95% maximum density. The finished elevation or stabilized subgrades shall not be above subgrade elevations shown on the Drawings.
 4. Exposed soil after excavations have been made shall be protected against detrimental damage and change in condition from physical disturbance and rain. Wherever possible, concrete footings shall be done the same day the excavation is made. If this is not done, the footing excavations shall be properly protected.
- G. All excavated materials that meet the requirements for backfill shall be stockpiled within the site (but not less than 25 feet from the surface borders of any excavation) for use as backfill, or for providing final site grades. All excavated materials which are not considered suitable for fill, and any surplus or excavated material which is not required for fill shall be disposed of off the site by the Contractor. Upon completion of the Work all on-site waste and disposal areas shall be cleaned and the debris removed from the site.
1. Materials deposited off the site shall be transported and placed in accordance with all applicable rules and regulations of all authorities having jurisdiction thereof. No surplus or unacceptable excavated materials of any kind shall be deposited in any stream or water course or dumped on public property. The different Work areas on the site shall be kept free of surface water at all times.

3.05 EXCAVATIONS FOR STRUCTURES

- A. Excavations for the construction of structures and foundations shall be carefully made to the depths indicated or required. Bottoms for footings, slabs, and grade beams shall be level, clean and clear of loose material, the lower sections to be true to size. Footings slab and grade beam bottoms shall be approved by the Project Architect/Engineer before any concrete is placed thereon.
- B. When the excavation has reached the design subgrade, the exposed subgrade shall be proof rolled. Proof rolling operation shall be inspected by the Project Engineer. Any soft or unconsolidated zones or area detected by proof rolling operations shall be undercut as directed by the Project Engineer. The undercut subgrade shall be scarified to a minimum depth of 6-inches and compacted to a minimum of 95% of the maximum density as determined by ASTM- D-698. After the undercut subgrade has been scarified and compacted the undercut shall be backfilled with select backfill to the design subgrade elevation in accordance with these specifications. The final subgrade shall be inspected and approved by the Project Engineer.
- C. In excavations for structures, where, in the opinion of the Project Architect/Engineer, the ground, not affected by high water level, is spongy or otherwise unsuitable for the contemplated foundation, the Contractor will be required to remove such unsuitable earth and replace it with suitable material properly compacted.
- D. Excavations for structures which have been carried below the depths indicated shall be refilled to the

proper grade with select backfill material properly compacted, in accordance with these Specifications.

- E. All pavement structure excavations shall be hand-trimmed to permit the placing of full widths, and subsurface drainage piping. Rounded and undercut edges will not be permitted.
- F. Excavation shall be extended a minimum of two feet on each side of structures, footings, etc., unless otherwise indicated on the Drawings.

3.06 DRIVEWAY ENTRANCE DRIVE EXCAVATIONS

- A. Excavation shall consist of excavation for the Driveway entrance drive in conformity with the lines, grades, cross sections, and dimensions shown on the Drawings and shall include the excavation of all unsuitable material from the subgrade.
- B. The subgrade shall be compacted to 95% maximum dry density at optimum moisture.

3.07 TRENCH EXCAVATIONS

- A. Trenches shall be excavated to a width which will provide adequate working space and clearances for proper pipe installation, jointing, and embedment, and subsurface drainage installation:
 - 1. Where pipe elevations are not shown on the Drawings, trenches shall be excavated to a depth sufficient to provide a minimum cover over the top of the pipe of 4 feet.
- B. Except where otherwise required, pipe trenches shall be excavated 6 inches below the underside of the pipe to provide for the installation of granular embedment pipe foundation material.
- C. Where in earth, trench bottoms for 6 inch or smaller pipe may be excavated below the pipe subgrade and granular embedment material provided as specified or the trench bottom may be graded to provide uniform and continuous support (between bell holes or end joints) or the installed pipe.
- D. Over-depths in trench excavation shall be backfilled with select backfill material properly compacted. Whenever unsuitable material that is incapable of properly supporting the pipe is encountered in the undercut required for bedding material, the unsuitable material shall be removed to the depth required and the trench backfilled to the proper grade with select backfill material properly compacted.
- E. Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.
- F. Where existing piping cross the new pipeline trench excavation, they shall be adequately supported and protected from damage due to construction. All methods for supporting and maintaining these facilities shall be subject to approval by the Project Architect/Engineer. Care shall be taken to insure that the existing pipeline grades and alignment are maintained and that the pipe joints are not disturbed. Backfill shall be carefully placed and tamped to prevent damage or future settlement. Any damage or misalignment of the existing piping due to construction or settlement shall be repaired by the Contractor at his expense. Where sanitary sewer lines cross potable water lines, encase sewer line in concrete. Reference Utility drawings for locations.

3.08 TRENCH AND EXCAVATION SAFETY PROGRAM (Refer to Section 01 50 00)

- A. Contractor shall provide trench excavation protection.
- B. Trench excavation protection shall be accomplished as required by the provisions of CFR 29, Part 19261, Subpart P - Excavations, Trenching and Shoring of the Occupational Safety and Health Administration Standards and Interpretations.
- C. Contractor shall submit a trenching plan, which has been approved and sealed by a professional engineer registered in the State of Texas, to Project Architect/Engineer prior to commencing construction.
- D. The trenching plan submitted by Contractor shall, as a minimum, comply with the requirements of the OSHA Safety and Health Standards.
- E. It is the sole duty, responsibility and prerogative of the Contractor, not the Owner, Engineer, or

Project Architect/Engineer to determine the specific applicability of the designed trench safety systems to each field condition and to make inspections of the trench safety systems.

1. The Contractor shall maintain a permanent record of inspections.
- F. The Contractor shall protect persons from injury at excavations, by barricades, warnings and illumination. Any work within the Public Right-of-Way shall comply to the latest revisions and requirements of the Texas Manual on Uniform Traffic Control Devices.
- G. Contractor shall coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.
- H. Prior to commencing excavation, Contractor shall give written notice to emergency medical service (EMS) stating location and nature of work. Contractor shall post phone number of emergency medical service near phone at each site.
- I. See Sections 01 50 00 and 31 23 33 for additional trenching requirements.

3.09 UNAUTHORIZED EXCAVATION

- A. All excavation outside the lines and grades shown, and which is not approved by the Project Architect/Engineer, together with the removal and disposal of the associated material shall be at the Contractor's expense. The unauthorized excavation shall be filled and compacted with approved backfill by the Contractor at his expense.

3.10 PLACEMENT OF FILL AND BACKFILL

- A. All select backfill and backfill required for structures, trenches and site demolition backfill required to provide the finishes grades shown and as described herein shall be furnished, placed and compacted by the Contractor.
- B. Backfill excavations as promptly as Work permits, but not until completion of the following:
 1. Acceptance by the Project Architect/Engineer of construction below finish grade.
 2. Inspection, testing, approval, and recording of locations of underground piping.
 3. Removal of concrete formwork.
 4. Removal of shoring and bracing and backfilling of voids with satisfactory materials.
 5. Removal of trash and debris.
- C. Fill containing organic materials or other unacceptable material shall be removed and replaced with approved fill material.

3.11 PLACEMENT OF SELECT BACKFILL, BACKFILL, AND FILL

- A. Select backfill shall be placed to the grades shown on the Drawings. The lift thickness and compaction moisture content range given herein are approximate. These values will be determined from the laboratory test results on the fill materials. Every lift of fill material shall be tested unless the Project Architect/Engineer determines that less quality control testing is acceptable.
- B. All select backfill shall be placed in horizontal loose lifts not exceeding 8 inches in thickness and shall be mixed and spread in a manner assuring uniform lift thickness after placing. Each lift shall be compacted by not less than two complete coverages of the specified compactor. Select backfill shall be placed to the underside of all compactor. Select backfill shall be placed to the underside of all concrete slabs. The maximum slope of select backfill to the subgrade shall be one vertical to one horizontal.
- C. Backfill and fill around and outside of structures and over select backfill shall be deposited in layers not to exceed 8 inches in uncompacted thickness and mechanically compacted, using platform type tampers. Compaction of structure backfilled by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of select backfill and/or backfill by inundation with water will not be permitted. All materials shall be deposited as specified herein and shown on the Drawings.
- D. The material shall be placed at a moisture content that falls in the range of laboratory optimum moisture content of minus three (-3) to plus three (+3) percentage points. It shall be compacted to a density as determined by ASTM D 1557 at 95% to the maximum laboratory dry density for

that material. The contractor shall provide equipment capable of adding measured amounts of water to the backfill and/or select backfill material to bring it to a condition within the range of the required moisture content. The Contractor shall provide equipment capable of disking, aerating, and mixing the soil to insure reasonable uniformity of moisture content throughout the fill material and to reduce the moisture content of the borrow material by air drying if necessary. If the subgrade or lift of earth material must be moisture conditioned before compaction, the fill material shall be sufficiently mixed or worked on the subgrade to insure uniform moisture content throughout the lift of material to be compacted. Materials at moisture content in excess for the specified limit shall be dried by aeration or stockpiled for drying. The moisture content shall be maintained as described above until the fill is permanently covered.

- E. No backfill or fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed. No compaction of fill will be permitted with free water on any portion of the fill to be compacted. No fill shall be placed or compacted in a frozen condition or on top of frozen material. Any fill containing organic materials or other unacceptable material previously described shall be removed and replaced with approved fill material prior to compaction.
- F. Each lift of compacted material shall be compacted by the designated number of coverages of all portions of the surface of each lift by a smooth-drum vibratory roller for granular material having a static weight not less than 5,500 pounds, a sheep'sfoot roller for cohesive material exerting a pressure of 250 psi on the surface of the feet, or equivalent equipment approved by the Project Engineer prior to commencement of the Work. One coverage is defined as the condition obtained when all portions of the surface of the fill material have been subjected to the direct contact of the compactor. The compactor shall be operated at a forward speed not exceeding 40 feet per minute.
- G. Compaction shall be performed with equipment suitable for the type of fill material being placed. The Contractor shall select equipment which is capable of providing the minimum density required by these Specifications. The gross weight of compacting equipment shall not exceed 7,000 pounds within a distance of ten feet from the wall of any completed structure. Equipment shall be provided that is capable of compacting in restricted areas next to structures and around piping. The effectiveness of the equipment selected by the Contractor shall be tested at the commencement of compacted fill Work by construction of a small section of fill within the area where fill is to be placed. If tests on this Section of fill show that the specified compaction is not obtained, the Contractor shall increase the amount of coverages, decrease the lift thickness or obtain a different type of compactor.
- H. Levels of backfill against concrete walls shall not differ by more than 2 feet on either side of walls unless walls are adequately braced or all floor framing is in place up to and including grade level slabs. Particular care shall be taken to compact structure backfill which will be beneath pipes, roads, or other surface construction or structures. In addition, wherever a trench passes through structure backfill, the structure backfill shall be placed and compacted to an elevation 12 inches above the top of the pipe before the trench is excavated. Compacted areas, in each case, shall be adequate to support the item to be constructed or placed thereon.
- I. The compaction requirements specified are predicated on the use of normal materials and compaction equipment. In order to establish criteria for the placement of a controlled fill so that it will have compressibility and strength characteristics compatible with the proposed structural loadings, a series of laboratory compaction and/or compressive strength tests will be performed on the samples of materials submitted by the Contractor. From the results of the laboratory tests, the final values of the required percent compaction, the acceptable compaction moisture content range, and the maximum permissible lift thickness will be established for the fill material and construction equipment proposed.

3.12 BACKFILL IN PIPE TRENCHES

- A. Pipeline trenches may be backfilled prior to pressure testing, but no structure shall be constructed over any pipeline until it has been tested.
- B. All pipe larger than 6 inches in diameter shall be placed on granular embedment material. Pipe 6 inches in diameter and smaller shall be placed in granular embedment material unless the

trench bottom has been graded to provide uniform and continuous support of the installed pipe.

- C. Embedment materials both below and above the bottom of the pipe, classes of embedment to be used, and placement and compaction of embedment materials shall conform to the following requirements:
1. Granular embedment shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle. After each pipe has been graded, aligned, and placed in final position on the bedding material, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations. Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement.
 2. Compacted backfill will be required for the full depth of the trench above the granular pipe embedment material. Where the trench for one pipe passes beneath the trench for another pipe or electrical ductbank, for the lower trench shall be compacted to the level of the bottom of the upper trench.
 3. Each layer of embedment material shall be compacted by at least two complete coverages of all portions of the surface of each lift using approved compaction equipment. One coverage is defined as the conditions reached when all portions of the fill lift have been subjected to the direct contact of the compacting surface of the compactor.
 4. The method for compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.
 5. The degree of compaction required for granular embedment is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D-1557.

3.13 BACKFILL IN ELECTRICAL DUCTBANK TRENCHES

- A. Compacted backfill will be required for the full depth of the trench above the electrical ductbank. Where the trench for one ductbank passes beneath the trench for another pipe or ductbank select backfill shall be placed to the level of the bottom of the upper trench.
- B. Placement and compaction of backfill in electrical ductbank trenches shall conform to the requirements of these Specifications.
- C. The electrical ductbank shall be placed in sand envelopes shown on the Drawings.

3.14 COMPACTION DENSITY REQUIREMENTS

- A. The degree of compaction required for all types of fills and exposed subgrades shall be as listed below. Material shall be moistened or aerated as necessary to provide the moisture content that will facilitate obtaining the specified compaction.

| <u>Material</u> | <u>ASTM</u> | <u>Required Density</u> | <u>Lift Thickness</u> |
|---|-------------|-------------------------|-----------------------|
| Exposed Subgrade Crawl In Underfloor Space | D698 | 90% | 6 inches |
| Select Backfill (Playground/ Non-use Open Areas) | D698 | 90% | 6 inches |
| Select Backfill Below Parking Areas | D1557 | 95% | 6 inches |
| Moisture Conditioned Subgrade | D698 | 95% | 8 inches |

| | | | |
|--|-------|-----|-----------|
| Backfill/Around Structures | D698 | 95% | 8 inches |
| All Other Backfill | D698 | 95% | 8 inches |
| Backfill/Flexible Base | D1557 | 95% | 8 inches |
| Backfill/Pipe Trenches | D698 | 95% | 12 inches |
| Backfill/Electrical | D698 | 95% | |
| Porous Granular Fill | D698 | 95% | 6 inches |
| Porous Granular Embedment/Pipe Trenches | D698 | 95% | 8 inches |
| Pit Run Sand around Utility Trenches | D698 | 95% | 8 inches |
| Clay | D698 | 90% | 8 inches |

The testing laboratory shall perform tests necessary to provide data for selection of fill material and control of placement water content.

- C. Field density tests to insure that the specified density is being obtained will be performed by testing laboratory during each day of compaction work. Number of test shall be approved by Project Architect/Engineer.
- D. If the tests indicate unsatisfactory compaction, the Contractor shall provide the additional compaction necessary to obtain the specified degree of compaction. All additional compaction work shall be performed by the Contractor at no additional cost to the Owner until the specified compaction is obtained. This Work shall include complete removal of unacceptable (as determined by the Project Architect/Engineer) fill areas and replacement and recompaction until acceptable fill is provided.

3.15 CRUSHED STONE PLACEMENT

- A. Crushed stone shall be placed where shown on the Contract Drawings.

3.16 SHEETING, SHORING AND BRACING

- A. Excavations for structures and pipe lines shall be open excavation, sheeted, shored and braced where necessary to prevent injury to workmen, structures, or pipe lines.
- B. All municipal, county, state and federal ordinances, codes, regulations and laws shall be observed.
- C. Used material shall be in good condition, not damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary work.
- D. All timber used for breast boards (lagging) shall be new or used, meeting the requirements for Douglas Fir Dense Construction grade or Southern Pine No. 2 Dense S3.
- E. All steel work for sheeting, shoring, bracing, cofferdams etc., shall be designed in accordance with the provisions of the "Specifications for the Design, Fabrication and Erection of Structural

Steel for Buildings", of the AISC except that field welding will be permitted.

- F. Steel sheet piling shall be manufactured from steel conforming to ASTM A 328. Steel for soldier piles, wales and braces shall be new or used and shall conform to ASTM A 36.
- G. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
- H. Unless otherwise shown, specified, or ordered, all materials used for temporary construction shall be removed when work is completed. Such removal shall be made in a manner not injurious to the structure or its appearance or to adjacent Work.

3.17 SHEETING LEFT IN PLACE

- A. Steel sheet piling shown to be left in place or ordered in writing to be left in place by the Project Architect/Engineer, shall consist of rolled sections of the continuous interlocking type unless otherwise approved. The type and design of the sheeting and bracing shall conform to the above specifications for all steel work for sheeting and bracing. Steel sheeting installed but not removed shall be new.
- B. Steel sheet piling to be left in place shall be driven straight to the lines and grades as shown or directed. The piles shall penetrate into firm materials with secure interlocking throughout the entire length of the pile. Damaged piling having faulty alignment shall be pulled and replaced by new piling.
- C. The type of guide structure used and method of driving for steel sheet piling to be left in place shall be subject to the approval of the Project Architect/Engineer. Jetting will not be permitted.
- D. Contractor shall cut off piling left in place to the grades shown or ordered by the Project Architect/Engineer and shall remove the cutoffs from the site.
- E. Contractor shall thoroughly clean wales, braces and all other items to be embedded in the permanent structure, and shall make provisions that the concrete surrounding the embedded element is sound and free from air pockets or harmful inclusions. The provisions shall include the cutting of holes in the webs and flanges of wale and bracing members, and the welding of steel diaphragm waterstops perpendicular to the centerline of brace ends which are to be embedded.
- F. Subsequent to removal of the inside face forms, and when removal of bracing is permitted, steel shall be cut back at least 2 inches inside the wall face and the opening patched with cement mortar. The concrete shall be thoroughly worked beneath wales and braces, around stiffeners and in any other place where voids may be formed.
- G. Portions of sheeting or soldier piles and breast boards which are in contact with the foundation concrete shall be left in place, together with wales and bracing members which are cast into the foundation or superstructure concrete.

3.18 FINAL GRADING AND EMBANKMENTS

- A. To the extent available backfill material from excavations shall be placed in accordance with these Specifications to final grades with a minimum compacted depth of 6 inches.
- B. After other outside Work has been finished, and backfilling and embankments completed and settled, all areas on the site of the Work which are to be graded shall be brought to a subgrade suitable with the indicated elevations, slopes, and contours with suitable excess excavation material. Subgrade shall be left below the finished grades shown on the Drawings to allow for topsoil placement. Reference Landscape Specifications for topsoil depth, where applicable.

3.19 TEXAS POLLUTANT DISCHARGE ELIMINATION SYSTEM (TPDES) GENERAL PERMIT

- A. The Contractor shall prepare and submit the following items to the Owner.
 - 1. Notice of Intent (NOI) for Storm Water Discharges Associated with Industrial Activity. This notice shall be prepared and filed with the TCEQ at least 48 Hrs. before the start of construction.
 - 2. Conform to the storm water pollution prevention plan.
 - 3. Notice of Termination (NOT) of coverage under the TPDES General Permit.
 - 4. The above documents will be filed with the TCEQ by the General Contractor. Contractor is to coordinate with Project Civil Engineer as necessary.

CONSTRUCTION DOCUMENTS
SPECIFICATIONS
ISSUED FOR CONSTRUCTION

CAMINO REAL WORK FORCE CTR
RENOVATION & EXPANSION PROJ.

EARTHWORK
31 00 00

END OF SECTION

SECTION 31 10 00 SITE CLEARING

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 of this section.

1.02 DESCRIPTION OF WORK

- A. Extent of site clearing is shown on drawings.
- B. Site clearing includes, but is not limited to:
 - 1. Removal of unwanted vegetation in the areas to receive site improvements, buildings, pavements, or fill and/or other areas of the site as directed by the Architect/Engineer.
 - 2. Topsoil stripping.
 - 3. Clearing and grubbing.
 - 4. Removing above-grade improvements.
 - 5. Removing below-grade improvements.

1.03 JOB CONDITIONS

- A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect improvements on adjoining properties and on Owner's property.
 - 2. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.
- C. No trees shall be removed until the building, drives, pavement areas, walks and other proposed improvements have been staked-out. After these areas have been staked-out, the Owner, and Architect/Engineer shall meet at the site with the Contractor to concur on which trees can be removed and which shall remain. The Contractor shall make minor modifications if directed to save existing trees which the Owner desires to have remain.
- D. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation not indicated or directed to be removed, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards as directed by the Architect/Engineer at all trees near areas affected by the construction to protect trees and vegetation to be left standing.
- E. Provide protection for roots over 1-1/2" diameter cut during construction operations. Cut faces shall be coated with emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

PART 2 - PRODUCTS

Not applicable to work of this section.

PART 3 - EXECUTION

3.01 SITE CLEARING

- A. General: Prior to site clearing, the Contractor shall stake-out the limits of new construction. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions within the limits of new construction. Remove such items elsewhere on site or premises as specifically indicated or directed. Removal includes digging out stumps and roots. The Contractor shall not remove any trees which are located outside the limits of new construction unless indicated on

the drawings to be removed or unless directed to do so by the Architect/Engineer. The Contractor shall take necessary precautions to protect all trees which are to remain, including providing barricades around trees located within ten feet (10') of any area of new construction.

- B. Topsoil: Topsoil is defined as fertile, friable clay loam (less than 60% clay content) surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 1" in diameter, and without weeds, roots, and other objectionable material. Topsoil must be capable of sustaining vigorous root growth.
1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
 2. Remove heavy growths of grass from areas before stripping.
 3. Stockpile acceptable topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust. The Contractor shall, however, be responsible for providing any and all additional topsoil as required.
 4. Dispose of unsuitable or excess topsoil same as waste material, herein specified.
- C. Clearing and Grubbing: Clear entire site of shrubs and other vegetation, including all underbrush.
1. Completely remove stumps, roots, and other debris protruding through ground surface.
 2. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 3. Place acceptable fill material in horizontal layers not exceeding 8" loose depth, and thoroughly compact to a density equal to adjacent original ground.
- D. Removal of Improvements: Remove all existing above-grade and below-grade improvements.

3.02 DISPOSAL OF WASTE MATERIALS

- A. Burning on Owner's Property: Burning will not be permitted.
- B. Removal from Owner's Property: Remove all waste materials and unsuitable and excess topsoil from Owner's property and dispose of off-site in a legal manner.

END OF SECTION

SECTION 33 22 13 – ROUGH GRADING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Remove topsoil and stockpile for later reuse.
- B. Excavate subsoil and stockpile for later reuse.
- C. Grade and rough contour site.

1.2 RELATED WORK

- A. Section 31 00 00 – Earthwork.
- B. Section 31 23 16 – Excavation.
- C. Section 31 23 23.13 – Backfill.
- D. Section 31 23 33 – Trenching and Backfilling

1.3 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01 70 00 'Contract Closeout'.
- B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.4 PROTECTION

- A. Protect benchmarks, existing structures, fences, and roads.
- B. Protect above or below grade utilities that are to remain.
- C. Repair all damage.

1.5 QUALITY ASSURANCE

- A. Owner is to employ a Testing Laboratory to perform Soil Testing and Inspection Service for quality control testing during grading and excavation operations.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Excavated material, graded free of roots, rocks larger than one (1) inch, subsoil, debris, and large weeds.
- B. Subsoil: Excavated material, graded free of lumps larger than six (6) inches, rocks larger than three (3) inches, and debris.
- C. Borrow: Borrow material for this project should consist of non-expansive select materials. Borrow material for this project shall be approved by the Architect/Engineer before use.
- D. Site Excavated Materials: Site materials may be used for fill, provided they are re-compacted to 95 percent (minimum) of the maximum dry density as obtained in the Standard Compaction Procedure (ASTM D-698) and placed in maximum eight-inch thick loose lifts. The width of actual compacted material will extend 2 feet beyond the edges of the proposed walkways and pavement areas. All areas that are not designated as walkways will be compacted to a minimum of 90%.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify the site conditions before beginning Work.
- B. Verify that survey benchmark and intended elevations for the Work are as indicated on Survey. Contractor will be responsible for verifying all horizontal distances for new and existing improvements

END OF SECTION

SECTION 31 23 16 EXCAVATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Excavation for building foundations.
- B. Excavation for paving, trenching and drainage fill course.
- C. Excavation for utility trenches.
- D. Excavation for retaining walls.

1.03 RELATED SECTIONS

- A. Section 01 40 00 - Quality Requirements.
- B. Section 31 00 00 - Earthwork.
- C. Section 31 22 13 - Rough Grading.
- D. Section 31 23 23.13 - Backfilling.
- E. Section 31 23 33 – Trenching and Backfilling

1.04 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are as indicated on the Boundary Survey.

PART 2 - PRODUCTS

- 2.01** Fill Material outside of building area to comply with ASTM D2487. Use only approved fill material, free of clay, rock, gravel larger than 3" in any dimension, debris, frozen materials, vegetable and other deleterious matter.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- C. Notify Project Architect/Engineer if unidentified below grade utilities are encountered during excavation operations for instructions on how to proceed.
- D. Protect above and below grade utilities which are to remain.
- E. Protect features remaining as a portion of final landscaping.
- F. Protect benchmarks, existing sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.02 EXCAVATION

- A. Excavate subsoil required to accommodate pavement structures, slabs-on-grade, paving and site structures and construction operations.
- B. Excavate to working elevations for foundation and underfloor Work. Coordinate all special requirements; reference Structural Drawings and Specifications.
- C. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.
- D. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- E. Hand trim excavation. Remove loose matter.
- F. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. Larger material will also be removed under this Section.
- G. Notify Project Architect/Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.
- H. Correct unauthorized excavation at no extra cost to Owner.
- I. Correct areas over-excavated by error in accordance with Section 31 23 23.13 'Backfill'.

- J. Remove excess material from site.
- K. Compact fill in areas to receive paving and walkways to 95% soil density; See Structural and Civil Drawings and Specifications for compaction requirements for structural components.
- L. Compact the exposed sub-grade areas in the underfloor to 90% soil density.
- M. Trenching: trenching for utilities to be carried to the building unless otherwise indicated in Drawings.

3.03 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 01 40 00 'Quality Requirements Services'.
- B. Provide for visual inspection of bearing surfaces.

3.04 PROTECTION

- A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation, from flooding and freezing.

END OF SECTION

SECTION 31 23 23.13 BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building perimeter and site structure backfilling to subgrade elevations.
- B. Site filling and backfilling at all demolition areas that are excavated.
- C. Fill under pavement structures and walkways.
- D. Backfilling for retaining walls.
- E. Consolidation and compaction.
- F. Fill for over-excavation.
- G. Geotextile fabric.

1.02 RELATED SECTIONS

- A. Section 01 40 00 – Quality Requirements: Testing Laboratory Services: Testing Fill compaction.
- B. Section 31 00 00 - Earthwork.
- C. Section 31 23 16 - Excavation.
- D. Section 31 23 33 – Trenching and Backfilling.

1.03 REFERENCES

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D-698- Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.
- C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- D. ASTM D-1557- Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 'Submittals'.
- B. Samples: Submit 10 lb. sample of each type of fill to testing laboratory, in air-tight containers.
- C. Mix designs and testing information for Lean Concrete and Controlled Low Strength Material.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

- A. Fill as specified on Drawings.
- B. Lean Concrete: concrete conforming to Section 03 30 00 with a compressive strength of 2,000 psi.
- C. Controlled Low Strength Material (CLSM – Flowable Fill): concrete conforming to City of San Antonio Standard Specification Item No. 413, or approved equal, with a 28 day unconfined compressive strength of 80 to 150 psi.

2.02 ACCESSORIES

- A. Vapor Retardant: 10 mil thick, polyethylene.
- B. Geotextile fabrics as shown on Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify fill materials to be reused are acceptable.

3.02 PREPARATION

- A. Generally, compact sub-grade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of sub-grade not capable of in-situ compaction. Backfill with approved fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy sub-grade surfaces.
- C. Maintain optimum moisture content of backfill materials to attain required compaction density.
- D. Slope grade away from walkways minimum 2%, unless noted otherwise.
- E. Make grade changes gradual. Blend slope into level areas.
- F. Remove surplus backfill materials from site unless otherwise directed by project Architect/Engineer.
- G. Leave fill material stockpile areas completely free of excess fill materials.

3.04 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus one inch from required elevations.

3.05 FIELD QUALITY CONTROL

- A. Owner will employ a Testing Laboratory to perform soil testing and inspection services for quality control testing. Field inspection and testing will be performed under provisions of Section 01 40 00 'Quality Requirements'.
- B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D1557 and with Section 01 40 00 'Quality Requirements'.
- C. Compaction testing will be performed in accordance with ANSI/ASTM D1556 and with Section 01 40 00 'Quality Requirements'.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- E. Proof roll compacted fill surfaces under paving.

3.06 PROTECTION OF FINISHED WORK

- A. Recompact fills subjected to vehicular traffic. Reference Final Site Grading Plan for special Flexible Base requirements.

END OF SECTION

SECTION 32 12 16 – ASPHALT PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Asphaltic concrete paving and surface sealer.
- B. Aggregate base course.

1.2 RELATED SECTIONS

- A. Section 31 00 00 – Earthwork
- B. Section 31 22 13 - Rough Grading.
- C. Section 31 23 23.13 - Backfill

1.3 REFERENCES

- A. Texas Department of Transportation Standard Specifications, 2014 Edition

1.4 PERFORMANCE REQUIREMENTS

- A. Paving: Designed for parking.

1.5 QUALITY ASSURANCE

- A. Conform to applicable Texas Department of Transportation Standards for paving Work on public property.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable Texas Department of Transportation Standards for paving Work on public property.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Asphalt Cement: In accordance with Texas Department of Transportation Standard Specification Item 340, Hot Mix Asphaltic Concrete Pavement, Type D Mix (No RAP or RAS will be accepted) and as indicated in Drawings.
- B. Flexible Base: In accordance with Texas Department of Transportation Standard Specification Item 247, Flexible Base and as indicated in Drawings

2.2 ACCESSORIES

- A. Primer: Homogeneous, medium curing, liquid asphalt. In accordance with Texas Department of Transportation Standard Specification Item 300, Asphaltic, Oils and Emulsions.
- B. Tack Coat: Homogeneous, medium curing, liquid asphalt. In accordance with Texas Department of Transportation Standard Specification Item 300, Asphaltic, Oils and Emulsions

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify base conditions prior to commencing Work.
- B. Verify that compacted sub-grade is dry and ready to support paving and imposed loads.
- C. Verify gradients and elevations of base are correct.

3.2 PREPARATION – PRIMER

- A. Apply primer in accordance with Texas Department of Transportation Standards
- B. Apply primer evenly and smoothly on base or sub-base over sub-grade surface at uniform rate not to exceed 0.20 gallons/square yard of surface or as approved by Civil Engineer.
- C. Use clean sand to blot excess primer.

3.3 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with Texas Department of Transportation Standards. Apply at a rate of 0.11 gallons/square yard of surface or as approved by Civil Engineer.

- B. Apply tack coat to contact surfaces of existing asphalt surfaces where the new entrance drives transition to the existing street.

3.4 PLACING ASPHALT PAVEMENT

- A. Install Work in accordance with Texas Department of Transportation Standards.
- B. Place asphalt within twenty four (24) hours of applying primer or tack coat.
- C. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- D. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.5 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with ten (10) foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation from True Elevation: Within 1/2 inch.

3.6 FIELD QUALITY CONTROL

- A. After placement, protect pavement from mechanical injury.

END OF SECTION

SECTION 32 13 20 CURBS AND SIDEWALKS

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 this Section.

1.02 SUMMARY

- A. Contractor shall furnish all labor, materials, equipment and incidentals required to provide concrete curbs and sidewalks as shown and specified.
- B. The types of Work covered by these Specifications are conventionally formed or machine formed curbs and conventionally - formed sidewalks.
- C. The thickness and extent of curbs and sidewalks are shown on the Drawings.
- D. Perform work on this Section in accordance with phasing requirements.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 31 20 00 – Earthwork
- B. Section 03 30 00 – Cast-In-Place Concrete

1.04 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. ASTM D 1190, Concrete Joint Sealer, Hot Poured Elastic type, or as otherwise shown on drawings.
- B. Applicator Qualifications: Demonstrate previous experience in installing concrete curbs and sidewalks.

1.05 SUBMITTALS

- A. Samples: Submit for approval samples, manufacturer's product data, test reports and material certifications as required in referenced Sections for concrete Work.
- B. Certificates: Manufacturer's certification that sealer meets Specification requirements.
- C. Shop Drawings: submit for approval copies of dimensioned layout of the Work, showing pattern, expansion joints and reinforcing.
- D. LEED Submittal Requirements:

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Reinforcing Bars: In accordance with Texas Department of Transportation Standard Specification Item 440, Reinforcement for Concrete.
- B. Concrete Materials: In accordance with Texas Department of Transportation Standard Specification Item 421, Hydraulic Cement Concrete.
- C. Expansion Joint Material: In accordance with Texas Department of Transportation Standard Specification Item 420, Concrete Substructures.

2.02 CONCRETE MIX, DESIGN AND TESTING

- A. Comply with requirements of Texas Department of Transportation Standard Specification Item 421, Hydraulic Cement Concrete.
- B. Design the mix to produce concrete having a minimum compressive strength, of 3,000 psi with a 5" slump range.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

- A. Preparation of the sub-grade including compaction shall be completed for the full width of the Work.
 - 1. Where the sub-grade is constructed by excavation of existing grade, the top six (6) inches of the sub-grade shall be compacted to at least 95 percent of maximum density at optimum moisture content.
 - 2. Where the sub-grade shall be made smooth and compacted per these Specifications or as shown on the Drawings.
 - 3. The existing grade shall be brought to the final lines and grades utilizing select backfill as specified in Section 31 00 00 - Earthwork. The compaction requirements of Section 31 20 00 apply to this Section.
- B. Base: Base shall be provided as shown on the Contract Drawings. The material shall be select backfill as specified in Section 31 00 00 - Earthwork, and compacted as specified.

3.02 FORM CONSTRUCTION

- A. Set forms to line and grade. Install forms over full length of curbs and sidewalks.

3.03 REINFORCEMENT

- A. Locate, place, and support reinforcement as shown. Size of reinforcement shall be as shown on Drawings.

3.04 CONCRETE PLACEMENT

- A. General: Comply with the requirements in accordance with Texas Department of Transportation Standard Specification Item 420, Concrete Substructures for mixing and placing concrete, and as specified.
- B. For concrete curbs and sidewalks, place concrete in one course, monolithic construction, for the full width and depth of curbs and sidewalks.

3.05 JOINTS

- A. General: Construct expansion, contraction, and construction joints with faces perpendicular to surface of the concrete curb and sidewalk. Construct transverse joints at right angles to the Work centerline and as shown on Drawings.
- B. Scored Contraction Joints: Provide these joints at ten (10) feet on centers for concrete curbs and five (5) feet on centers for sidewalks. Provide at closer spacing where indicated in Drawings for visual effect.
- C. Construction Joints: Place joints at locations where placement operations are stopped for a period of more than ½ hour, except where such pours terminate at expansion joints.
- D. Expansion Joints: Provide ½" inch expansion joint filler and pourable sealant where Work abuts structures; at returns; and at 30 foot spacing for straight runs. If curbs and sidewalks are not poured monolithically, provide expansion joints where each abuts the other.
- E. Place top of expansion joint material not less than ½" inch or more than 1 inch below concrete surface. Apply joint sealer on top of expansion joint material, flush with concrete surface, and in accordance with manufacturer's instructions.

3.06 CONCRETE FINISHING

- A. All sidewalk surfaces to receive light broom finish. All curbs to be smooth finish. Smooth surfaces to receive smooth finish by screeding and floating.
- B. Work edges of curb and sidewalk, and transverse joints; and round to 1/4 inch radius.
- C. Complete surface finishing by drawing a fine-hair broom across surface, perpendicular to line of traffic.

3.07 CURING

- A. Protect and cure finished concrete curbs and sidewalks, complying with applicable requirements of Section 03 30 00.

3.08 REPAIR AND CLEANING

- A. Repair or replace broken or defective curbs and sidewalks as directed by the Architect/Engineer.
- B. Sweep Work and wash free of stains, discolorations, dirt or other foreign material.

3.09 REPAIR OF EXISTING CONCRETE CURB AND SIDEWALK AREAS

- A. Repair and/or patch any and all damage to existing concrete curbs and sidewalk surfaces resulting from construction operations with materials to match existing.

3.10 SCHEDULE

- A. Concrete Sidewalks: 3,000 psi twenty eight (28) day concrete five (5) inches thick with #3 steel reinforcing bars at 12" on center both ways Portland Cement with medium, broom finish.
- B. Concrete Curbs: 3,000 psi twenty eight (28) day concrete, Portland Cement medium, broom finish.
- C. Concrete Ramps: 3,000 psi 28 day concrete, cast in place, Portland Cement, medium broom finish.

END OF SECTION

SECTION 32 17 23 PAVEMENT MARKINGS

PART 1 - GENERAL

- 1.01** This Specification describes the minimum optical and physical properties required for a thermoplastic road marking compound that is to be applied in a molten state, onto a pavement surface, to provide traffic stripes and/or markings.
- 1.02** The appearance of the finished markings shall have a uniform surface, crisp edges with a minimum over-spray, clean cut-off, meet straightness requirements and conform to the design Drawings and/or Engineer instructions.
- 1.03** Parking Area and Asphalt Playground Area pavement marking paint: Chlorinated rubber-alkyd type, ready-mixed, complying with Federal Spec TTP115E, Type III. Reference drawings for location and color.
- 1.04** Drive Area pavement marking paint: Thermoplastic paint complying with TxDOT standard specifications. Reference drawings for location and color.

PART 2 - PRODUCTS

- 2.01** Thermoplastic pavement marking material shall be a product especially compounded for traffic markings for use on either asphaltic or Portland cement concrete surfaces.

A. The following composition requirements shall be met:

| | White | Yellow |
|----------------------------------|----------|----------|
| Binder | 18% Min. | 18% Min. |
| TiO ₂ (Type 2 Rutile) | 12% Min. | N/A |
| Glass Spheres * | 48% Min. | 48% Min. |
| Yellow Pigment | N/A | 10% Min. |

2.02 BINDERS

- A. The alkyd binder shall consist of maleic modified rosin ester and other plasticizers.

2.03 PIGMENT

- A. The white pigment must be a rutile titanium dioxide meeting the standards of ASTM D 476, Type V.
- B. The yellow pigment must be heat-resistant and weather-stable. The yellow pigment may be either a double-encapsulated medium chrome yellow or a lead-free, organic yellow pigment (C.I. Pigment Yellow 83, opaque version). Do not mix pigment types within a batch.

2.04 PHYSICAL REQUIREMENTS

- A. The Meltdown Procedure for Thermoplastic, available from the Engineer, shall be used when conducting laboratory tests to verify the following property requirements.

2.05 COLOR

- A. The white thermoplastic shall be pure white and free from any tint. Using a Colorimeter, such as a Gardner color Difference Meter, the materials shall not show deviations from a magnesium oxide color standard that are greater than the following:

| Scale Definition | Magnesium Oxide Standard | Sample |
|------------------|--------------------------|------------|
| RD | 100 | 75% |
| Reflectance | | |
| a Red-Green | 0 | -5 to +5 |
| b Yellow-Blue | 0 | -10 to +10 |

PART 3 - APPLICATION - SURFACE PREPARATION

3.01 MOISTURE

- A. All surfaces shall be inspected for moisture content prior to application of thermoplastic. Approximately two square feet of a clear plastic or tar paper shall be laid on the road surface and held in place for 15 to 20 minutes. The underside of the plastic or tar paper shall then be inspected for a build up of condensed moisture from the road surface. If the amount of condensed moisture is of a sufficient amount to result in water dripping from the plastic or tar paper when held in a vertical position, thermoplastic shall not be applied. This moisture test shall be repeated until the moisture in the pavement surface has been allowed to evaporate to a level whereby there is not excessive build up of condensed moisture on the underside of the plastic or tar paper.

3.02 CLEANING

- A. All surfaces shall be clean and dry before thermoplastic can be applied. Loose dirt and debris shall be removed by blowing compressed air over the area to be striped. If the thermoplastic is to be applied over existing paint lines, the paint line shall be swept with a mechanical sweeper or wire brush to remove poorly adhered paint and dirt that would interfere with the proper bonding or the thermoplastic. Latence and curing compound shall be removed from all new Portland cement concrete surfaces by loose grain abrasive pressure blasting or wire brushing.

3.03 LAYOUT

- A. The pavement markings shall be placed in proper alignment with guidelines established on the pavement. Deviation from the alignment established shall not exceed 2-inches and, in addition, the deviation in alignment of the marking being placed shall not exceed 1-inch per 200 feet or pavement nor shall any deviation be abrupt.
1. Longitudinal markings shall be offset at least 2-inches from construction joints of Portland cement concrete surfaces and joints and shoulder breaks of asphalt surfaces.

3.04 PRIMER AND SEALER

- A. Primer sealer shall be used on all Portland cement concrete surfaces. A primer sealer shall be used on asphalt surfaces that are over two years old and/or on asphalt surfaces that are worn or oxidized to a condition where 50 percent or more of the wearing surface is exposed aggregate.

3.05 PRIMER SEALER APPLICATION

- A. When required as described, the primer-sealer shall be applied to the pavement surface in a

continuous film at a minimum thickness of 3 to 5 mils. Before the thermoplastic is applied, the primer-sealer shall be allowed to dry to a tacky state. The thermoplastic shall be applied within 4 hours after the primer application.

3.06 TEMPERATURE REQUIREMENTS: AMBIENT CONDITIONS

- A. The ambient air and road surface shall be 55°F and rising before application of thermoplastic can begin.

3.07 MATERIAL REQUIREMENTS

- A. The thermoplastic compound shall be heated from 400°F to 450°F and shall be a minimum of 400°F as it makes contact with pavement surface during application. An infrared temperature gun shall be used to determine the temperature of the thermoplastic as it is being applied to the pavement surface.

3.08 PACKAGING: CONTAINERS

- A. The thermoplastic material shall be delivered in 50 pound cardboard containers or 50 pound bags of sufficient strength to permit normal handling during shipment and handling on the job without loss of material.

3.09 LABELING

- A. Each container shall be clearly marked to indicate the color of the material, the process batch number and/or manufacturer's formulation number, the manufacturer's name and address and the date of manufacture.

3.10 MANUFACTURER'S RESPONSIBILITY: SAMPLING AND TESTING

- A. The manufacturer shall submit test results from an approved independent laboratory. All material samples shall be obtained twenty (20) days in advance of the pavement marking operations. The cost of testing shall be included in the price of thermoplastic material. The approved independent laboratory's test results shall be submitted to the Engineer in the form of a certified test report.

3.11 BILL OF LADING

- A. manufacturer shall furnish the Material and Tests Laboratory with copies of Bills of Lading for all materials inspected. Bill of lading shall indicate the consignee and the destination, date of shipment, lot numbers, quantity, type of material, and location of source.

3.12 MATERIAL ACCEPTANCE

- A. Final acceptance of a particular lot of thermoplastic will be based on the following:
 - 1. Compliance with the Specifications for material composition requirements verified by approved independent laboratory with tests results.
 - 2. Compliance with the specification for the physical properties required and verified by an approved independent laboratory with test results.
 - 3. Manufacturer's test results for each lot thermoplastic have been received.
 - 4. Identification requirements are satisfactory.

3.13 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall notify the Construction Inspector 72 hours prior to the placement of the thermoplastic markings enable the inspector to be present during the application operation. At the time of notification, the Contractor shall indicate the manufacturer and the lot numbers of the thermoplastic that he intends to use. A check should be made by the Contractor to insure that the approved lot numbers appear on the material package. Failure to do so is cause for rejection.
- B. If the normal trade practice for manufacturers is to furnish warranties or guarantees for the materials and equipment specified herein, the Contractor shall turn the guarantees and warranties over to the School Project Manager for potential dealing with the Manufacturers. The extent of such warranties or guarantees will not be a factor in selecting the successful bidder.

END OF SECTION

SECTION 32 31 13 CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 DESCRIPTION OF WORK

- A. Fence is to be complete with all fittings, straps, etc. required to provide a first class installation in keeping with the highest standards for security chain link fencing. Fencing fabric shall have knurled top and barbed bottom. Gate fabric shall have knurled top and knurled bottom.

1.03 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete.

1.04 APPLICABLE CODES AND REGULATIONS

- A. Comply with all applicable City of San Antonio codes and regulations.
- B. All posts and rails shall conform to requirements of ASTM-A120-73 if pipe, or ASTM-A123-73 if "C" section.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data, and installation instructions for fencing and gates.

PART 2 - PRODUCTS

2.01 All components shall be galvanized steel. Aluminum is not allowed.

2.02 Fence shall have a top rail. All tube ends shall be capped or plugged.

2.03 Fence shall have a 11-gauge bottom tension wire tied to fabric at 24" OC max.

2.04 All ties shall be #11 smooth galvanized steel wire at 24" on center on top rail, post, and bottom tension wire. Aluminum ties are not acceptable.

2.05 All gates shall generally lie in the fence line when closed and have LOCK OPEN POST to provide for locking the gate open 180° swing.

2.06 Erection shall be by mechanics experienced in fence erection with work plumb, square, straight and in line with accurately fitted tight joints, and securely anchored.

2.07 Fence fabric shall be maximum 1.5" off grade and cut into grade locally as required to maintain smooth top line. Where perimeter fence backs to an existing fence, a 3" off grade will be required for general maintenance and to maintain brush.

2.08 Concrete footing top finish shall be round, diameter to match footing, edges to be flush with grade, with a smooth one-inch crown.

2.09 Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Allied Tube and Conduit Corp.
2. Anchor Fence, Inc.
3. Colorguard Corp.
4. Davis Walker Corp.
5. Dominion Fence and Wire Prod.
6. United States Steel.

2.10 STEEL FENCING

A. Four Foot Chain Link Fence:

1. Line Posts:
Material – 2" by 2.72 lbs. linear feet (std. St.) galvanized steel pipe or C-section roll formed from steel conforming to ASTM A570-72, Grade E, 1.875" x 1.625" with minimum bending strength of 245 lbs. under a 6' cantilever load.

- Spacing – 10' maximum
2. Installation – set in concrete minimum of 10" diameter and minimum of 30" deep.
 3. Corner or Terminal Posts:
Material - 3" by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with minimum bending strength of 453 lbs. on 6' cantilever load.
Installation - set in concrete minimum of 12" in diameter and minimum depth 36".
Bracing - horizontal brace back to first line post with 2" std. wt.
Galvanized pipe - diagonal brace top of first line post to bottom of corner or terminal post with a galvanized 3/8" steel rod with tightening device.
 4. Gate Hinge Post:
 - a) 10' and wider gate.
Material - 6-5/8" by 18.97 lbs./linear ft. (std. wt.) galvanized steel pipe.
Installation - set in concrete, minimum 18" diameter by minimum depth of 60".
 - b) 5' to 9' wide gate.
Material - 4" by 9.10 lbs./linear ft. (std. wt.) galvanized steel pipe.
Installation - set in concrete, minimum 18" diameter by minimum depth of 48".
 - c) 3' to 4' wide gate.
Material - 3" by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with a minimum bending strength of 453 lbs. on a 6' cantilever load.
Installation - set in concrete, minimum of 12" diameter by minimum depth of 36".
 5. Gate - Latch Open Post:
Material - 3" by 5.79 lbs./linear ft. or shall be a roll formed section 3.5" x 3.5" with minimum bending strength of 453 lbs. on 6' cantilever load.
Installation - set in concrete minimum diameter 10" by minimum of 30" deep.
 6. Fabric: 9 gauge, 2" x 48" galvanized chain link.
 7. Fence Top Rail:
Material - 1-5/8" diameter by 2.27 lbs./linear ft. (std. wt.) galvanized steel tube or shall be a roll formed section of 1.625" x 1.25" channel shaped rail with minimum vertical bending strength of 192 lbs. on 10' span.
 8. Bottom Tension Wire:
Material - 11 gauge galvanized steel wire.
 9. Gate Construction: 6' and wider gates.
Frame - 2" by 2.72 lbs./linear ft. (std. wt.) galvanized steel pipe. Frame to include vertical members as required to divide gate into bays not to exceed one and one half times the gate height in length. All bays shall be of equal length. Each bay shall have one diagonal member with the top end of the diagonal towards the hinge end of the gate. All corners and trussing to be welded, or bolted, using heavy duty cast malleable iron fittings.
Filler - same as fence fabric.
Security - gate latches shall be suitable for locking.
3' to 5' wide gates same as 6' and wider except delete internal frame bracing.
- B. Five and Six Foot Chain Link Fence:
1. Line Posts:
Material - 2-3/8" by 3.65 lbs./linear ft. (std. wt.) galvanized steel pipe or C - section roll formed from steel conforming to ASTM A570-72, Grade E, 1.875" x 1.625" with minimum bending strength of 245 lbs. under a 6' cantilever load.
Spacing - 10' maximum.
Installation - set in concrete minimum of 12" diameter and minimum of 30" deep.
 2. Corner or Terminal Posts:
Material - 3" by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with minimum bending strength of 453 lbs. on 6' cantilever load.
Installation - set in concrete minimum of 12" in diameter and minimum depth 40".
Bracing - horizontal brace back to first line post with 2" std. wt.
Galvanized pipe - diagonal brace top of first line post to bottom of corner or terminal post with a galvanized 3/8" steel rod with tightening device.
 3. Gate Hinge Post:

- a) 10' and wider gate.
Material - 6-5/8" by 18.97 lbs./linear ft. (std. wt.) galvanized steel pipe.
Installation - set in concrete, minimum 18" diameter by minimum depth of 60".
- b) 5' to 9' wide gate.
Material - 4" by 9.10 lbs./linear ft. (std. wt.) galvanized steel pipe.
Installation - set in concrete, minimum 18" diameter by minimum depth of 48".
- c) 3' to 4' wide gate.
Material - 3" by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with a minimum bending strength of 453 lbs. on a 6' cantilever load.
Installation - set in concrete, minimum of 12" diameter by minimum depth of 40".
- 4. Gate - Latch Open Post:
Material - 3" by 5.79 lbs./linear ft. or shall be a roll formed section 3.5" x 3.5" with minimum bending strength of 453 lbs. on 6' cantilever load.
Installation - set in concrete minimum diameter 10" by minimum of 30" deep.
- 5. Fabric: 9 gauge, 2" x 60" for 5' fence and 72" for 6' fence.
- 6. Fence Top Rail:
Material - 1-5/8" diameter by 2.27 lbs./linear ft. (std. wt.) galvanized steel tube or shall be a roll formed section of 1.625" x 1.25" channel shaped rail with minimum vertical bending strength of 192 lbs. on 10' span.
- 7. Bottom Tension Wire:
Material - 9 gauge galvanized steel wire.
- 8. Gate Construction: 6' and wider gates.
Frame - 2" by 2.72 lbs./linear ft. (std. wt.) galvanized steel pipe. Frame to include vertical members as required to divide gate into bays not to exceed one and one half times the gate height in length. All bays shall be of equal length. Each bay shall have one diagonal member with the top end of the diagonal towards the hinge end of the gate. All corners and trussing to be welded, or bolted, using heavy duty cast malleable iron fittings.
Filler - same as fence fabric.
Security - gate latches shall be suitable for locking.
3' to 5' wide gates same as 6' and wider except delete internal frame bracing.
- C. Eight Foot High Chain Link Fence
 - 1. Line Posts:
Material - 2-3/8" by 3.65 lbs./linear ft. (std. wt.) galvanized steel pipe or C-section roll formed from steel conforming to ASTM-A570-72, Grade E, 2.25" x 1.70" with minimum bending strength of 316 lbs. under a 6' cantilever load.
Spacing - 10' maximum.
Installation - set in concrete minimum of 12" in diameter and minimum of 36" deep.
 - 2. Corner or Terminal Posts:
Material - 3" by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with minimum bending strength of 453 lbs. on 6' cantilever load.
Installation - set in concrete minimum of 12" in diameter and minimum of 40" deep.
Bracing - horizontal brace back to first line post with 2" std. wt.
Galvanized pipe - diagonal brace top of first line post to bottom of corner or terminal post with a galvanized 3/8" steel rod with tightening device.
 - 3. Gate Hinge Post:
8' to 16' wide gates
Material - 6-5/8" by 18.97 - lbs./linear ft. galvanized steel pipe.
Installation - set in concrete minimum of 18" diameter by minimum depth 72".
3' to 7' Wide Gates:
Material - 4" by 9.10 lbs./linear ft. galvanized steel pipe.
Installation - set in concrete minimum of 12" diameter by minimum depth 48".
 - 4. Gate - Latch Open Post
Material - 3" by 5.79 lbs./linear ft. galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with a minimum bending strength of 453 lbs. on a 6' cantilever load.
Installation - set in concrete minimum of 12" diameter by minimum depth 30".

5. Fabric shall be 9 gauge, 2" x 96" galvanized chain link, having barbed finished both edges.
6. Fence Top Rail:
Material – 1-5/8" by 2.27 lbs./linear feet. Galvanized steel tube or shall be a roll formed section 1.625" x 1.25" channel shaped rail with minimum vertical bending strength of 192 lbs. on 10' span.
7. Bottom Tension Wire:
Material shall be 9 gauge galvanized steel wire.
8. Gate Construction:
6' and wider:
Frame – 2" by 2.72 lbs./linear ft. (std. wt.) galvanized steel pipe. Frame to include vertical members as required to divide gate into bays not to exceed one and one half times the gate height in length. All bays shall be of equal length. Each bay shall have one diagonal member with the top end of the diagonal towards the hinge end of the gate. All corners and trussing to be welded, or bolted, using heavy-duty cast malleable iron fittings. Filler shall be same as fence fabric.
Security – gate latches shall be suitable for locking.
3' to 6' wide gates same as 6' and wider except delete internal frame bracing.
- D. Play Court Fencing (10 foot high chain link fence)
 1. Line posts shall be 3" by 5.79 lbs./linear feet (std. wt.) galvanized steel pipe.
Spacing – 10' maximum.
Installation – set in concrete minimum of 12" in diameter and minimum of 40" deep.
 2. Corner or Terminal Posts:
Material – 4" by 9.10 lbs./linear ft. (std. wt.) galvanized steel pipe.
Installation – set in concrete minimum of 18" in diameter and minimum of 48" deep.
Bracing – horizontal brace back to first line post with 2" std. wt.
Galvanized pipe – diagonal brace top of first line post to bottom of corner or terminal post with a galvanized 3/8" steel rod with tightening device.
 3. Fabric – 9 gauge, 1-3/4" x 120" galvanized chain link, having knurled edges top and bottom.
 4. Fence Top Rail:
Material – 1-5/8" by 2.27 lbs./linear ft. galvanized steel tube or shall be a roll formed section 1.625" x 1.25" channel shaped rail with minimum vertical bending strength of 192 lbs. on 10' span.
 5. Bottom Tension Wire:
Material – 9 gauge galvanized steel wire.
 6. Gate Construction
Same as for 8' high chain link fence.

2.11 INSPECTION

- A. All postholes shall be inspected and approved prior to the setting of any post in concrete. Any post set without hole inspection and approval shall be removed and reset at Contractor's expense.

2.12 CONCRETE

- A. Provide concrete consisting of portland cement, ASTM C 150 aggregates ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Do not begin installation and erection before final grading is completed, unless otherwise permitted.
- B. Excavation: Drill holes for posts of diameters and spacing as shown on plans in firm, undisturbed or compacted soil.

- C. Unless otherwise indicated, excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.
- D. Setting Posts: Center and align posts in holes 3" above bottom of excavation. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Finish top of concrete footing in cone shape for drainage away from post.
- E. Top Rails: Run rail continuously through post caps, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.
- F. Center Rails: Provide center rails where shown. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.
- G. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.
- H. Tension Wire: Install tension wires before stretching fabric and tie to each post with not less than 6 ga. galvanized wire. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings spaced 24" o.c.
- I. Fabric: Leave approximately 2" between finish grade and bottom salvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
- J. Stretcher Bars: Thread through or clamp to fabric 4" o.c., and secure to posts with metal bands spaced 15" o.c.
- K. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.
- L. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasp pipe and fabric firmly with ends twisted at least 2 full turns. Bend wire to minimize hazard to persons or clothing.
- M. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

END OF SECTION

SECTION 32 91 13
SOIL PREPARATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Landscape soil placement and finish grading for landscape work.
- B. Extent of soil preparation work as addresses entire site.
- C. Subgrade Elevations: Excavation, filling and grading are not specified in this section.

1.2 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements
- B. Section 01 56 39 - Landscape Protection
- C. Section 32 92 19 - Seeding
- D. Section 32 93 10 - Landscape Maintenance

1.3 SITE CONDITIONS

- A. Verification of Dimensions:
 - 1. All scaled and figured dimensions are given for estimate purposes only.
 - 2. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and sizes, etc., and shall assume full responsibility for the correctness of all such items.
- B. Existing Conditions:
 - 1. New work shall be tied to existing conditions and controls such as existing grades.
 - 2. Finished grades shall bear proper relationship to such controls.
- C. The Contractor shall adjust new work as necessary and as directed to meet existing conditions and fulfill intent of the plans.
- D. Obstructions: If any unknown utilities and obstacles are encountered during the construction period, stop work and immediately contact the Project Manager / Architect before proceeding.
 - 1. Such obstructions shall be removed or relocated or the work adjusted as directed by the Landscape Architect.
 - 2. If work proceeds without contacting the Landscape Architect, the Contractor shall be held liable for any and all damages.
- E. Underground Utilities:
 - 1. Prior to initiating any work of this section, the Contractor shall contact the appropriate authorities in order that their personnel can locate underground utilities that may be encountered.
 - 2. Coordinate with other trades on project concerning installation of new utilities that may be affected.
- F. Existing Vegetation:
 - 1. Portions of the existing vegetation shall remain as indicated on the drawings.
 - 2. The Contractor shall take all means necessary to protect the existing vegetation. Any existing vegetation to remain that is damaged shall be replaced.
 - 3. New work shall be tied to existing conditions and controls such as existing planting beds. Bed expansions shall bear proper relationship to such controls.
- G. Subgrade Elevations:
 - 1. Excavation, filling and grading required to establish elevations shown on drawings are not specified in this section.

2. Subgrade elevations shall be established prior to placement of landscape soils to allow for placement to depths as indicated/required.
 - a. Contractor is responsible to coordinate establishment of subgrade elevations as required for landscape soils.
 - b. Conditions in which subgrade elevations have not been provided, Contractor is responsible to complete excavation required and properly dispose of resulting spoils off-site.

1.4 SOURCE QUALITY CONTROL

- A. Analysis and Standards:
 1. Package standard products:
 - a. Packaged and sealed standard products accompanied by manufacturer's or vendors' analysis, complying with specification requirements, will be acceptable.
 2. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists, wherever applicable.
- B. Topsoil Source:
 1. Obtain soil for use in landscape areas from the site. Scope summary:
 - a. Post emergent herbicide applications to kill existing grasses / weeds. (Refer to Article - WEED TREATMENT.
 - b. Once kill is satisfactory, the quantity of soil required, as to be confirmed by the Contractor, would be stripped and stockpiled for landscape use in establishing finish grade.
 - c. Once adequate material for landscape is obtained, site grading continues to prepare for new improvements and rough grading of site to provide subgrade required for finish per landscaping to final grade per Civil.
 - d. With subgrade established and the required subgrade preparation completed, the stockpiled material from the site would be distributed to establish finish grade.
 2. Other references to this requirement found in topsoil description of this Section - Materials of the specifications.
- C. Presence of Non-specified Grasses and Weeds:
 1. The Project Manager / Architect reserves the right to inspect landscape areas from time of installation to Final Acceptance.
 2. Any evidence of non-specified grasses or weeds will be cause for rejection and replacement of the unacceptable areas.

1.5 SUBMITTALS

- A. Furnish at Landscape Architect's office, prior to installation, the following information/samples:
 1. Topsoil (import):
 - a. 1-gallon container of soil.
 2. Soil Additives: Label from bag (Supplier's statement of analysis if bulk), and one ounce sample.
 3. Herbicide: Label from container or Supplier's brochure.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Packaged Materials:
 1. Deliver packaged materials in original containers showing weight, analysis and name of manufacturer.
 2. Protect materials from deterioration during delivery, and while stored at site.

1.7 ABBREVIATIONS

- A. C.Y. Cubic Yard
- B. S.Y. Square Yard
- C. S.F. Square Feet
- D. L.F. Linear Feet

1.8 JOB CONDITIONS

- A. Basic Regulations:
 - 1. Soil preparation operations shall be conducted under favorable weather conditions during the seasons which are normal for such work as determined by acceptable practice in the locality.
- B. Contractor is hereby notified of active utilities and caution shall be exercised to avoid interruption of services.
- C. The Contractor is responsible for replacement of any buried utilities, irrigation lines, etc., if they are broken during the soil preparation operations.
 - 1. Contact the appropriate utility to get the locations of underground utilities.
 - 2. The replacement costs are at the Contractor's expense.
- D. When it is necessary to cross paved areas, curbing or walks, protection against damage shall be provided by the Contractor.
- E. When conditions detrimental to landscape work are encountered during soil preparation, such as rubble fill, adverse drainage conditions, or obstructions, notify Project Manager / Architect before initiating work.
 - 1. Such obstructions shall be removed or relocated or the work adjusted as directed by the Landscape Architect.
 - 2. If work proceeds without contacting the Landscape Architect, the Contractor shall be held liable for any and all revisions necessary.

1.9 WARRANTY & GUARANTEES

- A. Repair:
 - 1. When any portion of the surface becomes gullied or otherwise damaged or treatment is destroyed during the Project's warranty period, the affected portion shall be repaired to reestablish condition and grade of soil to as it was prior to injury as directed.
 - 2. Repair work required shall be performed without cost to the Owner.
- B. Repair shall be made within 10 days of notification or as soon as weather conditions are satisfactory.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Topsoil (Stripped From Site):
 - 1. Screen to be free of stones 2 inch and greater in size, and objectionable extraneous material and debris of any size.
 - 2. Stripped from site; refer to Article 3.02 Stockpile Existing Soil.
- B. Topsoil (Import): Landscapers Four-Way Mix (topsoil, sand, compost and cedar), screened, Acceptable manufacturers:
 - 1. New Earth Soils & Compost, San Antonio, Texas, (210) 661-5180.
 - 2. Fertile Garden Supply, San Antonio, Texas, (210) 688-9435.
 - 3. Gardenville, San Antonio, Texas, (210) 651-6115.
 - 4. Quality Organic Products, San Antonio, Texas, (210) 651-0200.

2.2 SOIL ADDITIVES

- A. Soil Conditioner: Compost, composted for a period of eight (8) weeks or longer, organic, derived from animal manure, wood shavings, hay, seed hulls, stable bedding, or other organic residue, without dust, objectionable odors, viable weed seed; aerobic and friable.
 - 1. Approved Manufacturers:
 - a. New Earth Soils and Compost, San Antonio, Texas, (210) 661-5180.
 - b. Fertile Garden Supply, San Antonio, Texas, (210) 688-9435.
 - c. Garden-Ville, San Antonio, Texas, (210) 651-6115.
 - d. Quality Organic Products, San Antonio, Texas, (210) 651-0200.

- B. Humates: Standard Ag, 70% humic acid standard agricultural grade low sodium humates, naturally occurring, unaltered oxidized lignite, crushed to 1/4" particle size. Supplier - Mesa Verde Resources; contact Joel Reid (505) 362-4205; www.humates.com.

2.3 MISCELLANEOUS

- A. Post-Emergence Herbicide: Round-Up by Monsanto Corp., or approved equal.

PART 3 - EXECUTION

3.1 WEED TREATMENT

- A. Performance of weed treatment procedures herein described applies to preparation of site prior to stripping soil for landscape use and preparation of areas not disturbed by grading to receive landscape treatment.
- B. All site locations to receive planting where weeds exist, shall be treated with post-emergent herbicide.
 - 1. Repeat treatment as required that no weeds are present at the beginning of work on the landscape planting of the Project.
- C. No weeds shall be present at the date of inspection for Substantial Completion of the Project and at the conclusion of the maintenance and establishment period following acceptance of the Contractor's work.
- D. Post-emergent weed treatment includes:
 - 1. Removal of weeds and other undesirable ground cover vegetation in turf/grass and planting areas shall be accomplished a minimum of 14 days prior to soil preparation for planting operations.
 - 2. Care shall be taken not to affect existing trees or shrubs to be saved on the site.
 - 3. Care shall be taken to not affect plants on adjacent site.
- E. Weed Treatment Procedure
 - 1. Mow grass and/or existing weeds to 3-inch height.
 - 2. Spray herbicide on a day that is not rainy, not windy and adequately warm.
 - a. Within 24 hours of cutting grass/weeds.
 - 3. Do not disturb soil for 14 days. If live, green weeds remain, repeat as required to kill all weeds, before disturbing soil.
 - 4. After 14 days, scalp and mechanically rake soil when the soil is not excessively hard or dry (water the soil if necessary) to remove 85% of dead foliage above grade.
 - 5. The remaining dead material shall be allowed to accumulate in place and shall be incorporated into the soil through the rototilling of the soil preparation work.

3.2 STOCKPILE EXISTING SOIL

- A. After completion and approval of Weed Treatment operations, strip topsoil within areas that will be built to attain the quantity of material required.
 - 1. Contractor shall confirm depth to strip soil to attain the quantity required.
- B. Strip and stockpile the soils according to soil type and use.
- C. Stockpiling the soils:
 - 1. Depth of stockpiled soil shall be no more than:
 - a. 4 feet for clay soil.
 - 2. Maintain soil moisture in piles:
 - a. Field soil - moderately damp.
 - 3. Protect piles from wind and water erosion by covering with either:
 - a. Hay
 - b. Hydromulch slurry (reference section Seeding).
 - 4. Handle the soil only to disperse the soil at the appropriate location for the final placement and preparation.

3.3 SUBGRADE PREPARATION PRIOR TO PLACEMENT OF LANDSCAPE SOILS

- A. Areas disturbed by new construction and grading.

- B. Confirm establishment of subgrade elevations to achieve positive drainage after placement of landscape soils and completion of finish grading.
- C. The Contractor is to report immediately upon his awareness, any site condition or situation of the contiguous landscape that would cause flooding, washing or concentration of excess surface water to the areas receiving planting or turf /grass.
- D. Irrigation work shall be completed after rototilling and compaction, herbicide spraying, scalping and removal of vegetative debris and rough grading, but prior to finish grading.
- E. Prior to placement of landscape soils, cultivate subgrade to a minimum of 4 inches to alleviate compaction. Remove stones over 2-inch diameter and sticks, roots, rubbish and other extraneous debris of any dimension.
- F. Regrade site as required, if disturbed by weed removal, for positive drainage.
- G. Excavate subsoil to depth required to allow for placement of landscape soils and associated preparation.
- H. After the irrigation system is in place, the entire area shall be raked smooth and all rocks, roots and debris 1 inch in diameter or larger removed.
- I. Refer to RECONDITIONING SITE in this section for treatment of :
 - 1. Turf/grass areas beyond those disturbed by grading.

3.4 SOIL PLACEMENT

- A. The Contractor is to report immediately upon his awareness, any site condition or situation of the contiguous landscape that would cause flooding, washing or concentration of excess surface water to the planting areas.
- B. Landscape soils are to be placed to achieve the compacted depth to the specified elevation relative to site elements (e.g. curbs, paving and walls).
 - 1. Contractor is responsible to coordinate establishment of subgrade elevations as required for landscape soils.
 - 2. Conditions in which subgrade elevations have not been provided, Contractor is responsible to complete excavation required and properly dispose of resulting spoils off-site.
- C. Place landscape soils to obtain uniform site grade and the minimum compacted depth required.
 - 1. The site shall be free from irregular surface changes and shall vary uniformly between fixed elevations.
 - 2. Restore landscape areas to above specified condition if any eroded places, ruts or depressions exist or otherwise disturbed after fine grading and prior to planting.
 - 3. Complete irrigation work prior to finish grading.
- D. Depth placement (compacted) schedule:
 - 1. Topsoil:
 - a. 6 inches of topsoil in turf/grass areas unless noted otherwise on plan.
 - b. At condition when material stripped from the site does not provide the quantity of topsoil required, Contractor shall furnish Landscapers Four-Way Mix. All costs for supplemental topsoil shall be fully borne by the Contractor.

3.5 TURF/GRASS AREA SOIL PREPARATION

- A. Protection:
 - 1. Take care and preparation in work to avoid conditions which will create hazards. Post signs or barriers as required.
 - 2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
 - 3. Keep site well drained and landscape excavations dry.
- B. Surface Preparation:
 - 1. Complete amending soil seven days maximum prior to turf installation:
 - 2. Coordinate with general cultivation required of overall area for placement of landscape soils; coordinate with civil work.

3. Rake area to remove clods, rocks, weeds, roots, and debris.
- C. Incorporation of Amendments:
 1. Soil Conditioner: Prior to fine grading, incorporate a minimum of 1 inch of soil conditioner (3.7 cubic yards per 1000 square feet) into the top four (4) inches of the soil in turf/grass areas. (See RECONDITIONING SITE this section, for additional direction.)
 - a. Do not rototill/cultivate soil after rain to retain soil structure and avoid compaction of soil. Wait until soil has had adequate time to dry.
 2. After placement of topsoil to the depths specified, spread humates at the rate specified over all landscape areas.
 - a. Application rate- 700 pounds per acre.
- D. Fine grade planting areas to smooth, even surface with loose, uniformly fine texture.
 1. Roll, rake and drag planting areas, remove ridges and fill depressions, as required to meet finish grade.
 - a. Tolerance at 1/2 inch variance from a plane line within landscape areas established by two points at a distance of 20' (utilizing string line or 2 X 4).
 2. Compact the entire area to a maximum dry density not less than 85 percent and not more than 90 percent.
 - a. After preparation of turf/grass areas and with top soil in semi-dry condition, roll planting areas in two directions at approximately right angles with water ballast roller weighing 100 to 300 lbs according to soil type.
 3. Limit fine grading to areas which can be planted immediately after grading.
 4. Allow for grass thickness in areas to be sodded or seeded. Finish grade of soil shall be:
 - a. 1-1/2 inches below top of pavement in sodded areas.
 - b. 1 inch below top of pavement in areas to be seeded.
- E. Grade and shape area to receive turf/grass to bring surface to true uniform planes free from irregularities and to provide drainage and proper slope to catch basins.
- F. After turf/grass areas have been prepared, take no heavy objects over them except turf/grass rollers.
- G. Rake or scarify and cut or fill irregularities that develop as required until area is true and uniform, free from lumps, depressions, and irregularities.
- H. Turf Areas Under Existing Trees
 1. Soil preparation under existing trees includes the removal by hand of surface vegetation not to remain.
 - a. Herbicide shall not be used.
 2. Amend existing soil with soil conditioner.
 - a. Spread soil conditioner over area to 1 inch depth.
 - b. Incorporate soil conditioners by hand to 4 inch depth into existing soil; use of power driven equipment prohibited.

3.6 RECONDITIONING SITE

- A. Reconditioning site includes:
 1. Existing turf/grass areas damaged by Contractor's operations including storage of materials and equipment and movement of vehicles.
 2. Areas not damaged by construction or disturbed by grading that are indicated to receive new landscape treatment.
 3. Incorporating a minimum of 1 inch of soil conditioner without changing the elevation of the soil contiguous to curbs and sidewalks, beneath canopies of trees and other fixed features.
- B. Process sequence for preparation of the soils prior to the turf/grass planting including herbiciding, excavation and placement:
 1. The entire area to receive soil conditioner to be reconditioned shall be treated to kill weeds; weeds shall be completely dead.
 2. The weed treatment shall be inspected and approved by the Project Manager / Architect prior to beginning this work. See WEED TREATMENT this section.

3. If rainfall has not been sufficient to loosen soil, the entire area shall be watered beginning a minimum of one week prior to cultivating operation and continued until enough moisture is present to enable cultivating.
4. Cultivate or rototill the entire area where turf/grass is to be reconditioned to a minimum 4-inch depth.
 - a. Remove rocks and debris.
 - b. Compact to a maximum dry density not less than 80 percent and not more than 85 percent.
 - c. Work within dripline of trees to be done by hand.
- C. Remove diseased and unsatisfactory turf/grass areas; do not bury into soil.
 1. Remove topsoil containing foreign materials including materials resulting from Contractor's operations including oil drippings, stone, gravel and other loose building materials.
 2. Replace with approved topsoil as required.
- D. Excavate 2 inches of the existing soil contiguous to the walks, curbs, and other site improvements. Taper the excavation to meet existing grade 15 feet away from the beginning edge.
 1. Where existing trees are within the area to be excavated and tapered and when existing grade is below the elevation of the walk, wall or etc., being tapered away from, the soil around the tree roots shall be loosened to a depth of 3 inches being careful not to damage roots.
 2. When existing grade is at or above the elevation of walk, wall or etc., being tapered away from, the soil around the tree roots shall be loosened and removed to a depth corresponding to the depth of taper where the tree is, being careful not to damage roots.
 3. This work shall be done by hand, unless otherwise approved by Landscape Architect, to protect the tree roots.
- E. Excavated soil may be deposited within the turf/grass areas spread smooth and tapered to existing grades to follow existing drainage patterns.
 1. No area shall receive more than a 3-inch depth of re deposited excavated soil at its deepest point.
 2. When existing trees occur within an area where excavated soils are being spread no excavated soil shall be spread inside of the dripline of the trees.
- F. Soil shall not be deposited in a manner which creates ponding in any area.
- G. When excavation and redistribution of excavated soil is complete, a minimum of 1 inch of soil conditioner shall be placed over the entire area to receive soil preparation.
- H. Irrigation work shall be completed after rototilling and compaction but prior to finish grading.
- I. After the irrigation system is in place, the entire area shall be raked smooth removing all rocks, roots and debris 1 inch in diameter or larger.
- J. The site shall be free from irregular surface changes and shall vary uniformly between fixed elevations.
- K. Finish grading shall be below the top of concrete walks and other site features affected by grade:
 1. One and a half (1-1/2) inches in sodded areas.
 2. One (1) inch in seeded areas.
 3. The site shall be ready for planting, inspected and approved by the Landscape Architect.

3.7 CLEANUP AND PROTECTION

- A. During soil preparation work, all rocks, clods and other debris, shall be removed daily and the site kept neat at all times.
- B. Any excess excavated subsoil or topsoil shall be removed from the site.

- C. After soil preparation operations are finished, all paved areas which may have become strewn with soil or other material shall be thoroughly cleaned by sweeping, and if necessary, power washing.

3.8 INSPECTION AND ACCEPTANCE

- A. Review of the soil preparation is required prior to initiating any planting work; work will not be accepted otherwise.
- B. When soil preparation is completed, Project Manager / Architect will, upon written request by the Contractor, make an inspection to determine acceptability.
- C. Where inspected soil preparation work does not comply with requirements, replace rejected work until reinspected by the Project Manager / Architect and found to be acceptable.

END OF SECTION

SECTION 32 92 19
SEEDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Extent of seeding work is shown on drawings and in schedules.
- B. Seeding work encompasses any and all areas disturbed by construction operations not indicated to be sodded.
- C. Finish Grade Elevations:
 - 1. Work to establish finish grades is not specified in this section; refer to Section - Soil Preparation.

1.2 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Shop Drawings, Product Data and Samples
- B. Section 32 91 13 - Soil Preparation
- C. Section 32 93 10 - Landscape Maintenance

1.3 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 SITE CONDITIONS

- A. Refer to Section 32 91 13, Soil Preparation.

1.5 SOURCE QUALITY CONTROL

- A. General: Seeding materials shall meet or exceed the Specifications of Federal, State and local laws requiring inspection for plant disease and insect control.
- B. Analysis and Standards:
 - 1. Package standard products with manufacturer's certified analysis.
 - 2. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists, wherever applicable.
- C. Inspections:
 - 1. All necessary state, federal, and other inspection certificates shall accompany the invoice for each shipment or order for seeding materials as may be required by law.
 - 2. The Project Manager / Architect reserves the right to reject, at any time or place, prior to final Acceptance of the work, any or all of the seeding materials which fail to meet requirements of these specifications.
 - 3. The Project Manager / Architect reserves the right to inspect seeded areas from time of installation to Final Acceptance.
 - 4. The time of inspection shall be after the grass has gone unmowed for a minimum of two weeks.
 - 5. Any evidence of non-specified grasses or weeds will be cause for rejection and replacement of the unacceptable seeded areas.

1.6 SUBMITTALS

- A. Furnish at Project Manager / Architect's office, prior to installation, the following information/samples:
 - 1. Seed: Submit seed supplier's certification of grass species. Identify source location.
 - 2. Commercial Starter Fertilizer: Product Label and Supplier's brochure.
 - 3. Biostimulant: Product Label and Supplier's brochure.
 - 4. Herbicide: Product Label and Supplier's brochure.
 - 5. Mulching Agent: Label from bag and 1-ounce sample.
- B. Furnish at Landscape Architect's office, prior to close-out of Project, the following:
 - 1. Maintenance Instructions: See Section - LANDSCAPE MAINTENANCE for requirements.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Packaged Materials:
 - 1. Deliver packaged materials in original containers showing weight, analysis and name of manufacturer.
 - 2. Protect materials from deterioration during delivery, and while stored at site.

1.8 ABBREVIATIONS

- A. S.Y. Square Yard
- B. S.F./sq. ft. Square Feet
- C. # Pound(s)

1.9 JOB CONDITIONS

- A. Basic Regulations:
 - 1. Seeding operations shall be conducted under favorable weather conditions during the seasons which are normal for such work as determined by acceptable practice in the locality.
 - 2. Contractor is hereby notified of active utilities and caution shall be exercised to avoid interruption of services.
 - a. Contractor is responsible for replacement of any buried utilities, irrigation lines, etc. if they are broken during seeding operation.
 - b. It is recommended that he contact the appropriate utility to get the locations of underground utilities. The replacement costs are at the Contractor's expense.
 - 3. When it is necessary to cross paved areas, curbing or walks, protection against damage shall be provided by the Contractor.
 - 4. When conditions detrimental to turf/grass growth are encountered during seeding, such as rubble fill, adverse drainage conditions, or obstructions, notify Project Manager / Architect before seeding.
 - a. Such obstructions shall be removed or relocated or the work adjusted as directed by the Landscape Architect.
 - b. If work proceeds without contacting the Landscape Architect, the Contractor shall be held liable for any and all revisions necessary.
- B. Planting Sequence:
 - 1. Plant turf/grass after final grades are established.
 - a. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.
- C. Maintenance: Conduct maintenance operations until Final Acceptance of project. Refer to Section - LANDSCAPE MAINTENANCE.
- D. Time Period of Seeding Operation:
 - 1. Seeding of turf/grass areas shall occur within the periods specified in Section - Lawn Materials.

2. Any additional work required, e.g. repair of erosion, weed control, temporary winter seeding, reseeding and any other work associated with the installation and germination/establishment of the turf/grass, due to not completing the turf/grass in this time period shall be fully borne by the Contractor.

1.10 WARRANTY & GUARANTEES

- A. Contractor shall guarantee that at the end of 1-year following Final Acceptance, all turf/grass areas have established grass, are uniform in color and quality, and are reasonably free from visible imperfections.
 1. Any turf/grass areas not in this condition will be replaced at no expense to the Owner.
- B. The Contractor shall not be held responsible for damages to turf/grass areas due to the Owner's neglect, the general building or other contractor's working on the site, application of fertilizers, pesticides or other materials not applied by him, or for damage caused by theft or vandalism.
- C. Inspection to determine the condition of the turf/grass areas prior to final acceptance of Project will be made by the Project Manager / Architect upon receiving such a request from the Contractor at a minimum of 2 months following acceptance of initial planting.
 1. Correction shall be as herein specified, and repeated until turf/grass is thoroughly established at all designated locations.
- D. Repair:
 1. When any portion of the surface becomes gullied or otherwise damaged or treatment is destroyed, the affected portion shall be repaired to reestablish condition and grade of soil to as it was prior to injury as directed.
 2. Repair work required shall be performed without cost to the Owner.
 3. Repair shall be made within 10 days or as soon as weather conditions are satisfactory for planting.

PART 2 - PRODUCTS

2.1 SOIL ADDITIVES

- A. Commercial Fertilizer:
 1. Deliver mixed as specified in standard size bags, showing weight, analysis, and name of manufacturer.
 2. Store in a weatherproof storage place, and in such a manner that it will be kept dry and its effectiveness will not be impaired.
 3. Provide the following product(s):
 - a. Starter Fertilizers (Hydromulch Seeding): 13-13-13 or 15-15-15 water soluble fertilizer.
 - b. Maintenance Fertilizer: 5-3-2 Soil Food manufactured by Gardenville (210) 651-6115.
- B. Soil Modifiers:
 1. Biostimulant: Agri-Gro Ultra, manufactured by Agri-gro Marketing, Inc., Doniphan, MO 63935; 800-881-8801; contact Shannon Smith 417-234-6873; www.agrigro.com.
- C. Herbicide:
 1. Non-selective Post-Emergence Herbicide: Round-Up by Monsanto Corp., or approved equal.
 2. Selective Post-Emergence Herbicide: Certainty by Monsanto Corp., or approved equal.

2.2 LAWN MATERIALS

- A. Grass Seed:
 1. Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by the U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act and the Texas Seed Law.
 - a. Seed which has become wet, moldy or otherwise damaged in transition in storage will not be accepted.
 - b. The seed shall not contain any objectionable foreign material that will hinder proper distribution.

- c. All seed shall have been treated with an approved fungicide by commercial or state laboratory not more than six months prior to date of planting.
- 2. All seeding rates indicated are based on Pure Live Seed (PLS). Contractor is to calculate the number of pounds of seed to achieve the PLS rate specified based on the seed PLS percentage certified by the seed supplier (e.g. seeding rate 10#'s PLS per 1000 s.f.; seed from supplier certified at 65% PLS; amount of seed to be applied calculated as 10#'s /65% PLS = 15.38#'s; 15.38#'s per 1000 s.f. required to achieve 10#'s PLS per 1000 s.f.). The seeds planted per area unit shall be of the type specified with the mixture, rate and planting conditions as follows:
 - a. Warm Season Grass:
 - 1) Black Jack (Cynodon dactylon 'Black Jack') - 3#PLS/1000SF - March 30 to September 15.
 - (a) The period September 1 to March 1 is not considered suitable for seeding bermuda grass. During this period the soil will be stabilized by one seeding of cool season grass.
 - (1) After March 30 the areas seeded with cool season grass are to be reseeded with the specified warm season grass after preparation.
 - (2) Cool season grass is to be closely mowed and to be allowed to burn out.
 - (3) After the cool season grass is dead, the area is to be lightly scarified and overseeded with specified Bermudagrass and reestablished prior to acceptance by the Owner.
 - b. Cool Season Grass:
 - 1) Annual Rye Grass:
 - (a) The period September 15 to May 15 is not considered suitable for seeding warm season grass. During this period the soil will be stabilized by one seeding of Gulf annual ryegrass.
 - (1) Seeding Rate: 4#PLS/1000 sf.
 - (2) After March 30 the areas seeded with rye grass are to be reseeded with warm season grass after preparation.
 - (3) Rye grass is to be closely mowed and to be allowed to burn out.
 - (4) After the rye grass is dead, the area is to be lightly scarified and overseeded with bermuda grass and reestablished prior to acceptance by the Owner. See warm season grass requirements.

2.3 MISCELLANEOUS LANDSCAPE MATERIALS

- A. Water: Furnished by the Contractor. Hose and other watering equipment to be provided by Contractor.
- B. Mulching Agent (Type 1): Provide Weyerhaeuser virgin wood fiber mulch, Silva-Fiber, distributed by James Lincoln Corp., Garland, Texas, (972)840-2440 or approved equal.

PART 3 - EXECUTION

3.1 HYDROMULCH SLURRY

- A. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.
- B. Mix starter fertilizer and mulching agent in water, using equipment specifically designed for hydromulch application.
 - 1. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
- C. Apply slurry uniformly to all areas to be seeded.
 - 1. Rate of application as required to obtain specified seed sowing rate.
 - 2. Hydromulch slurry mix type dependent on slope and conditions per the following:
 - a. Type 1- Standard mix for slopes less than 4:1 to flat.
- D. Type 1 hydro-mulching slurry placed in single application to consist of:
 - 1. Grass seed as specified.

2. 50#/s/1000 sq. ft. mulching agent.
 3. 20#/s/1000 sq. ft. water soluble fertilizer: 15-15-15 at 6.6 #/s/1000 sq. ft. or 13-13-13 at 7.6#/s/1000 sq. ft.
 4. 1.5#/s/1000 sq. ft. glue agent.
 5. BioStimulant at the rate as recommended per the manufacturer's instructions.
 - a. 32 ounces per acre.
- E. Seed any areas beyond the areas indicated to be seeded or sodded which are disturbed as a result of construction operations.

3.2 INSTALLATION

- A. Seeding Schedule:
1. The period September 1 to March 1 is not considered suitable for seeding warm season grass.
 - a. During this period, the soil will be stabilized by one seeding of cool season grass.
 - b. The period of March 30 to September 1, the cool season grass is to be treated as previously stated and the seed bed prepared according to this section.
- B. Site Tolerances: Final grade of soil after seeding of turf/grass areas is complete shall be one inch below top of adjacent pavement of any kind.
- C. Hydromulch Seeding - After turf/grass areas are graded, apply slurry evenly.

3.3 FIELD QUALITY CONTROL

- A. Inspection:
1. Seeded areas will be accepted at final inspection if:
 - a. Seeded areas are properly established.
 - b. Turf/grass is free of bare and dead spots and without weeds; see Section - Inspection and Acceptance.
 - c. No surface soil is visible when grass has been cut to height of 2 inches.
 - d. Seeded areas have been mowed a minimum of twice.

3.4 MISCELLANEOUS LANDSCAPE WORK

- A. Watering:
1. Keep surface of soil from drying out watering lightly and frequently through complete germination.
 2. When grass seedlings have 3 to 5 blades per sprout, reduce watering frequently to 2 to 3 hours per week.
 3. Increase duration of water application to achieve deep soil penetration to facilitate development of deeper, healthy root systems.
 4. Alternate soil moisture from good deep soakings to moderately dry in between waterings.
 5. Reduce frequency of waterings after establishment of plants.
 6. Coordinate supplemental waterings after established with seasonal rainfall.

3.5 MAINTENANCE: REFER TO SECTION 32 93 10 - LANDSCAPE MAINTENANCE.

3.6 CLEANUP AND PROTECTION

- A. Protect existing vegetation, pavements, and facilities from damage due to seeding activities; restore damaged items to original condition or replace, at no extra cost to Owner.
- B. During seeding work, all debris shall be removed daily and the site kept neat at all times.
- C. After seeding operations are finished, all paved areas, structures and etc. which may have become strewn with seeding materials shall be thoroughly cleaned by sweeping.
- D. Protect other landscape work and materials from damage due to seeding operations, operations by other contractors and trades and trespassers.
 1. Maintain protection during installation and maintenance periods.
 2. Treat, repair or replace damaged seeding work as directed.

3.7 INSPECTION AND ACCEPTANCE

- A. When seeding work is completed, including maintenance, Project Manager / Architect will, upon written request by the Contractor, make an inspection to determine acceptability.
 - 1. The evaluation will be made no earlier than 60 days after planting.
- B. A satisfactory stand of grass plants from the seeding operation for turf/grass areas shall be a minimum 100 grass plants per square foot. Bare spots shall be a maximum 12 inches square. The total bare spots shall be a maximum 2 percent of the total seeded area.
- C. Where inspected seeding work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by the Project Manager / Architect and found to be acceptable.

END OF SECTION

SECTION 32 93 10
LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Maintenance of the landscape to be provided.

1.2 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Shop Drawings, Product Data and Samples
- B. Section 32 91 13 - Soil Preparation
- C. Section 32 92 19 - Seeding

1.3 REFERENCE STANDARDS

- A. The most current edition of the publications listed below form a part of this specification to the extent referenced. The following publications by the American National Standards Institute (ANSI) are referred to in the text by the basic designation only.
 - 1. ANSI Z60.1 Nursery Stock.
 - 2. ANSI Z133.1 Tree Care Operations- Pruning, Trimming, Repairing, Maintaining, and Removing Trees and Cutting Brush.
 - 3. ANSI A300 Tree, Shrub and Other Woody Plant Maintenance- Standard Practices.

1.4 SUBMITTALS

- A. Furnish at Landscape Architect's office, prior to close-out of Project, the following:
 - 1. Maintenance Instructions.
 - 2. Watering Schedule.

1.5 JOB CONDITIONS

- A. Maintenance operations shall be conducted under favorable weather conditions during the seasons which are normal for such work as determined by acceptable practice in the locality.
- B. Maintenance operations shall be conducted until Final Acceptance of Project (or otherwise specified).

PART 2 - PRODUCTS

2.01 MATERIALS- REFER TO RESPECTIVE LANDSCAPE SECTIONS FOR APPLICABLE MATERIALS.

PART 3 - EXECUTION

3.1 LANDSCAPE MAINTENANCE - GENERAL

- A. Obtain and follow the maintenance instructions provided by the installer of new plant materials.
- B. Watering, Soil Erosion, and Sedimentation Control: Comply with Federal, state, local, and other regulations in force; prevent over-watering, run-off, erosion, puddling, and ponding.
 - 1. Site grading and planting have been designed to resist erosion once fully grown, with temporary measures in place during establishment period.
 - 2. Repair temporary erosion control mechanisms provided by others.
 - 3. Repair eroded areas and replant.
 - 4. Prevent sediment from entering storm drains.

- C. General Cleanup: Remove debris from all landscape areas at least once a week and from turf areas before each mowing.
 - 1. Debris consists of trash, rubbish, dropped leaves, downed branches and limbs of all sizes, dead vegetation, rocks, and other material not belonging in landscaped areas.
 - 2. Remove debris from site and dispose of properly.
- D. Trees: Exercise care to avoid girdling trees; provide protective collars if necessary; remove protective collars at end of maintenance period.
- E. Fertilizing: Apply fertilizer as indicated.
- F. Earth Mound Watering Basins: Maintain in good condition and as required to permit efficient application of water without waste; reapply mulch if soil surface shows maintaining depth required.
- G. Health Maintenance: Inspect all plants regularly for health:
 - 1. Eradicate diseases and damaging pests, regardless of severity or speed of effect.
 - 2. Treat accidental injuries and abrasions.
 - 3. If a plant is unhealthy but not yet dead, according to specified definitions, determine reason(s) and take remedial action immediately.
 - 4. Remove dead plants immediately upon determining that they are dead.
- H. Pesticide and Herbicide Application: Comply with manufacturer's instructions and recommendations and applicable regulations.
 - 1. Obtain Owner's approval prior to each application.
 - 2. Obtain Landscape Architect's approval prior to each application.
 - 3. Apply in manner to prevent injury to personnel and damage to property due to either direct spray or drifting, both on and off Owner's property.
 - 4. Use backflow preventers on hose bibbs used for mixing water; prevent spills.
 - 5. Inspect equipment daily before application; repair leaks, clogs, wear, and damage.
 - 6. Do not dispose of excess mixed material, unmixed material, containers, residue, rinse water, or contaminated articles on site; dispose of off site in legal manner.
 - 7. Rinse water may be used as mix water for next batch of same formulation.
 - 8. Contractor is responsible for all recordkeeping, submissions, and reports required by laws and regulations.

3.2 MAINTENANCE

- A. Maintain landscape plantings by pruning removal of dead wood, cultivating, watering, weeding and mulching as required for normal, healthy growth.
 - 1. Restore planting saucers.
 - 2. Dress Mulching:
 - a. Maintain not less than four (4) inches over tree pits.
 - b. Keep mulch six (6) inches away from tree trunk.
 - 3. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required.
 - 4. Treat as required to keep trees and shrubs free of insects and disease.
- B. Maintain turf/grass areas by watering, fertilizing, weeding, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable turf, free of eroded or bare areas (total bare area no greater than 2 percent of total area).
 - 1. Mowing shall be accomplished to maintain grass at a 1-3/8- to 1½-inch height.
 - 2. Mowing shall not remove more than 1/3 height of the grass at each mowing.
 - 3. Water turf/grass areas until Final Acceptance of project.
 - 4. Water to provide an equivalent of 1 inch water per week for the establishment of all turf/grass areas to the satisfaction of the Landscape Architect.
 - 5. Keep turf free of thatch, woody plant roots, diseases, nematodes, soil-borne insects, stones larger than 1 inch in diameter, and other materials detrimental to grass growth.
 - 6. Eliminate all broadleaf weeds, sedges and patches of foreign grass.

- C. Apply maintenance fertilizer to all turf/grass areas within the project limits, 30 days following initial installation at rate to provide 1# nitrogen/1000 SF.
- D. Three (3) weeks following completion of landscaping/seeding and sodding, Contractor shall complete one additional application of Biostimulant as per manufacturer's recommendations.
 - 1. 160 ounces per acre.

3.3 ITEMS TO BE FURNISHED

- A. Maintenance Instructions:
 - 1. Submit typewritten instructions recommending procedures to be established by the Owner for the landscape maintenance over the first year.
 - 2. Instructions shall present maintenance procedures/activities to be implemented over a one year period on a month by month basis.
- B. Watering Schedule:
 - 1. The watering schedule is to include the duration and frequency each irrigation zone will run per week.
 - 2. This will be worked out jointly with the Landscape Irrigation Contractor and shall be programmed on to the controller after review by Landscape Architect.
 - 3. Program shall be submitted to the Owner as part of the final acceptance process.

3.4 CLEANUP AND PROTECTION

- A. Protect existing vegetation, pavements, and facilities from damage due to maintenance activities/operations, operations by other contractors and trades and trespassers; restore damaged items to original condition or replace, at no extra cost to Owner.
 - 1. Treat, repair or replace damaged landscape work as directed.
- B. Remove fallen deciduous leaves in Fall; removal may wait until all leaves have fallen.
- C. Clean adjacent pavements of plant debris and other debris generated by maintenance activities.
- D. Remove and dispose of general cleanup debris and biodegradable debris in a proper manner.
 - 1. Biodegradable Debris: Owner's trash collection facilities may not be used; dispose of off site in accordance with applicable regulations.
 - 2. Non-Biodegradable Debris: Owner's trash collection facilities may not be used; dispose of off site in accordance with applicable regulations.
- E. During maintenance period, all debris shall be removed daily and the site kept neat at all times.
- F. After maintenance operations are finished, all paved areas which may have become strewn with soil or other material shall be thoroughly cleaned by sweeping, and if necessary, power washing.

3.5 INSPECTION AND ACCEPTANCE

- A. When maintenance period is complete, Project Manager / Architect will, upon written request by the Contractor, make an inspection to determine acceptability.
- B. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by the Project Manager / Architect and found to be acceptable.

END OF SECTION

SECTION 33 00 00 UTILITIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. Reference Division 22 for building plumbing requirements.

1.02 SUMMARY

- A. This Section includes all underground utility systems five (5) feet outside the proposed buildings. Systems include the following:
 - 1. Sanitary Sewerage.
 - 2. Water and Fire Lines.
 - 3. Gas Main.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 03 Section 30 00 'Cast-in-Place Concrete' for cast-in-place concrete structures.

1.03 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Non-pressure-Piping Pressure Ratings:
 - 1. At least equal to system test pressure.

1.04 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
 - 1. Product data for the following:
- B. Shop drawings for pre-cast concrete manholes and other structures. Include frames and covers.
- C. Shop drawings for cast-in-place concrete or field-erected manholes and other structures. Include frames and covers.
- D. Reports and calculations for design mixes for each class of cast-in-place concrete.
- E. Shop drawings for cleanouts.
- F. Coordination drawings showing manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures, invert elevations and pipe sizes at manholes, and rim elevations of structures.
- G. Inspection and test reports specified in the "Field Quality Control" Article.

1.05 QUALITY ASSURANCE

- A. Environmental Agency Compliance: Comply with regulations pertaining to sanitary sewerage potable water and gas piping systems.
- B. Utility Compliance: Comply with regulations pertaining to sanitary sewerage systems. Include standards of water, gas and other utilities where appropriate.
- C. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components and are based on specific Manufacturer types indicated. Other Manufacturers' products with equal performance characteristics may be considered. Refer to Section 01 60 00.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures in direct sunlight.
- B. Do not store plastic pipe or fittings in direct sunlight.
- C. Protect pipe, pipe fittings, and seals from dirt and damage.
- D. Handle pre-cast concrete manholes and other structures according to Manufacturer's rigging instructions.

1.07 PROJECT CONDITIONS

- A. Site Information: Verify that survey benchmark and intended elevations for the Work are as shown on the Drawings, research public utility records, and verify existing utility locations. All bidders will be required to visit the site prior to bidding to verify the actual job site conditions. Any conflicts with construction documents must be brought to the attention of the Project Engineer for instructions to bidders. Adjustments or removal of existing utilities such as vaults, meters, valves, telephone poles, power poles, overhead lines, hydrants, etc. that are necessary for the construction of this project will be considered as part of the Contract Bid and will not justify a change in Contract Price or additional cost to the Owner after the project is awarded.

1.08 SEQUENCING AND SCHEDULING

- A. Coordinate water and fire system connections with the local water purveyor.
- B. Coordinate with other utility and earthwork.
- C. Coordinate installation with all utility building Plumber Contractors.

PART 2 - PRODUCTS

2.01 PIPES AND FITTINGS

- A. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A 74, service and extra-heavy classes, gray cast iron, for gasketed joints.
 - 1. Gaskets: ASTM C 564, rubber, compression type, thickness to match class of pipe.
- B. Ductile-Iron Pipe for Water and Fire Mains: AWWA C151, Class 150 minimum, for push-on joints.
 - 1. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
 - 2. Pipe and Fitting Interior Coating: AWWA C104, asphaltic-material seal coat, minimum 1-mil (0.025-mm) thickness.
 - 3. Gaskets: AWWA C111, rubber.
- C. Polyvinyl Chloride (PVC) Sanitary Sewer Pipe and Fittings: ASTM D 3034, SDR 26 (as noted on drawings), for solvent-cemented or gasketed joints.
 - 1. Primer: ASTM F 656.
 - 2. Solvent Cement: ASTM D 2564.
 - 3. Gaskets: ASTM F 477, elastomeric seal.
- D. Polyvinyl Chloride (PVC) Pressure Pipe and Fittings: CLASS 150 pipe, AWWA C 900, for integral bell and spigot joints. Blue Brute or equal for underground water lines. Class 200 pipe, AWWA C900 for fire line, schedule 80 PVC for pipe sizes less than 4 inches.
- E. Polyethylene Pipe (PE) Gas Distribution and Fittings: ASTM D 2513 -"Standard Specification for Thermoplastic Gas Pressure Pipe, tubing and Fittings." Manufactured by Phillips Disco Pipe, Inc., required equivalent.

2.02 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Ductile-Iron, Flexible Expansion Joints: Compound fitting with a combination of flanged and mechanical-joint ends conforming to AWWA C110 or AWWA C153. Include 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections, rated for 250-psig minimum working pressure and FDA-approved epoxy interior coating for offset and expansion indicated. Include polyethylene (PE) film encasement.

2.03 PIPE ENCASEMENT

- A. Include AWWA C105, polyethylene film tube and sheet, 8-mil (0.2-mm) thickness for the following:
 - 1. Cast-iron soil pipe and fittings.
 - 2. Ductile-iron piping.
 - 3. Pressure-type pipe couplings.
 - 4. Ductile-iron, special pipe fittings.

2.04 MANHOLES

- A. Pre-cast Concrete Manholes: ASTM C 478, pre-cast, reinforced concrete, of depth indicated, with provision for rubber gasket joints.
 - 1. Ballast: Increase thickness of pre-cast concrete sections or add concrete to base section, as required to prevent floatation.
 - 2. Base Section: Six (6) inch minimum thickness for floor slab and four (4) inch minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor.
 - 3. Riser Sections: five (5) inch minimum thickness, forty eight (48) inch diameter, and lengths to provide depth indicated.
 - 4. Top Section: Concentric cone or flat-slab-top type as indicated. Top of cone of size that matches grade rings.
 - 5. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
 - 6. Grade Rings: Include two (2) or three (3) reinforced-concrete rings, of 6- to 9-inch total thickness, that match a twenty four (24) inch- diameter frame and cover.
 - 7. Steps: Fiber glass, individual steps or ladder. Include a width that allows a worker to place both feet on one step and is designed to prevent lateral slippage off the step. Cast steps or anchor ladder into base, riser, and top section sidewalls at twelve (12) to sixteen (16) inch intervals. Steps will be included in all manholes and structures that are a minimum of five (5) feet deep, whether shown on Drawings or not.
 - 8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.
- B. Manhole Frames and Covers: ASTM A 536, Grade 60, heavy-duty ductile iron Include 32-inch (minimum) inside diameter by 6-inch riser with 4-inch minimum width flange, and 30-inch diameter cover. Include indented top design with lettering, equivalent to the following, cast into cover:
Sanitary Sewerage Piping Systems: SANITARY SEWER
Storm Sewerage Piping Systems: STORM SEWER
Provide manhole ring and cover with concrete ring encasement as per San Antonio Water System requirements.
- C. Manhole Coating: All structures and non-structures shall be water tight and interior wall coated with a San Antonio Water System approved sewer structural coating.

2.05 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
 - 1. Cement: ASTM C 150, Type II.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.
- B. Structures: Portland-cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cement ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland-cement design mix, 4000 psi minimum, with 0.45 maximum water-cement ratio.
 - 1. Include channels and benches in sanitary sewerage manholes.
 - 2. Manhole Channels: Concrete invert, formed to same width as connected piping, with height of the vertical sides to 3/4 of the pipe diameter. Form curved channels with smooth, uniform radius and slope.

2.06 PROTECTIVE COATINGS

- A. General: Include factory- or field-applied protective coatings to structures and appurtenances according to the following:
- B. Coating: 2- coat, coal-tar epoxy, 15-mil minimum thickness, except where otherwise indicated.
 - 1. Manholes: On exterior surface.
 - 2. Trench Plates and Covers: On exterior surface.
 - 3. All exposed metal surfaces: On exterior surfaces.

2.07 CLEANOUTS

- A. Description: ASME A112.36.2M, round, cast-iron housing with clamping device and round, secured, scoriated, cast-iron cover. Include cast-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
 - 1. Secure with cast iron Box with Locking Cover.
 - 2. Light Duty: In earth or grass, foot-traffic areas.
 - 3. Medium Duty: In paved, foot-traffic areas.
 - 4. Heavy Duty: In vehicle-traffic service areas.
 - 5. Extra Heavy Duty: In roads.
- B. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, service class, cast-iron soil pipe and fittings.

PART 3 - EXECUTION

3.01 IDENTIFICATION

- A. Arrange for installation of color coded warning tapes directly over piping and at all above ground temporary markers.
 - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures (Reference Utility Drawings for color code sequence)
- B. Refer to Part 2 of this Section for detailed Specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to the following applications.
- C. Pipe Sizes 4 to 6 Inches: Hub-and-spigot, service class, cast-iron soil pipe and fittings; compression-type gaskets; and gasketed joints.

3.02 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of underground sewerage, water and gas systems piping. Location and arrangement of piping layout take into account many design considerations. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to Manufacturer's Recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- C. Use the manholes for changes in direction, except where fittings are indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and transition couplings, where different sizes or materials of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- E. Install gravity-flow-systems piping at constant slope between points and elevations indicated. Install straight piping runs at constant slope, not less than that specified, where slope is not indicated.
- F. Extend utility piping five (5) feet and cap five (5) feet from the new buildings of sizes and in locations indicated. Terminate piping as indicated on Drawings.
- G. Install sewerage piping pitched down in direction of flow, at minimum slope of one (1) percent (1:50) and thirty six (36)-inch minimum cover, except where otherwise indicated.

3.03 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to the following:
- B. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber compression gaskets according to CISPI "Cast Iron Soil Pipe and Fittings Handbook," Volume I. Use gaskets that match class of pipe and fittings.
 - 1. Install polyethylene film encasement over cast-iron soil pipe and fittings according to ASTM A 674 or AWWA C105.

- C. Ductile-Iron Pipe with Ductile-Iron or Cast-Iron Fittings: With push-on-joint, rubber gaskets according to AWWA C600.
 - 1. Install polyethylene film encasement over ductile-iron pipe and ductile- and cast-iron fittings according to ASTM A 674 or AWWA C105.
- D. Polyethylene (PE) Plastic Pipe and Fittings: As follows:
 - 1. Join pipe, tubing, and fittings with couplings for soltight joints according to AASHTO "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4 "Joint Properties" and manufacturer's written instructions.
 - 2. Join pipe, tubing, and gasketed fittings with elastomeric seals for watertight joints according to ASTM D 2321 and Manufacturer's written instructions.
 - 3. Install according to ASTM D 2321 and manufacturer's written instructions.
- E. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings: As follows:
 - 1. Join solvent-cement-joint pipe and fittings with solvent cement according to ASTM D 2855 and ASTM F 402.
 - 2. Join pipe and gasketed fittings with elastomeric seals according to ASTM D 2321.
 - 3. Join profile sewer pipe and ribbed drain pipe and gasketed fittings with elastomeric seals according to ASTM D 2321 and Manufacturer's written instruction.
 - 4. Install according to ASTM D 2321.
- F. Gas Pipe and Fittings: All Gas Piping shall be accurately cut to measurement established at the job by the Contractor, and shall be worked into place without springing or forcing. Proper provisions shall be made for expansion and contraction of all pipe lines.
- G. All Gas Piping shall be properly supported to prevent undue strain or sagging. All polyethylene piping above ground shall be supported by hangers. Hangers spacing shall not exceed the following maximum distance between supports: Polyethylene Pipe 4'-0"
- H. Before being placed in position, all pipe, fittings and equipment shall be cleaned carefully. All materials and equipment shall be maintained in a clean condition and upon completion of final tests and acceptance shall be left in a clean condition.
- I. Unions shall be installed in piping where necessary for easy dismantling of the piping and apparatus.
- J. Pipe fittings shall be free of fins and burrs prior to installation. No bushings will be allowed in any piping.
- K. All piping shall be made up straight and true at proper grades.

3.04 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318, ACI 350R, where indicated.

3.05 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in a cast-in-place concrete block, 18 by 18 by 6 inches deep or as shown on Drawings. Set with tops one (1) inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete paving with tops flush with surface of paving.

3.06 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as the Work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
 - 1. Place plug in end of incomplete piping at end of day and whenever Work stops.
 - 2. Flush piping between manholes and other structures, if required by authorities having jurisdiction, to remove collected debris.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of the Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:

3. Alignment: Less than full diameter of inside of pipe is visual between structures.
 4. Deflection: Flexible piping with deflection that prevents passage of a ball or cylinder of a size not less than 92.5 percent of piping diameter.
 5. Crushed, broken, cracked, or otherwise damaged piping.
 6. Infiltration: Water leakage into piping.
 7. Exfiltration: Water leakage from or around piping.
 8. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
 9. Re-inspect and repeat procedure until results are satisfactory.
- C. Test new piping systems and parts of existing systems that have been altered, extended, or repaired for leaks and defects in accordance to Section 22 05 13.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to authorities having jurisdiction.
 3. Schedule tests, and their inspections by authorities having jurisdiction, with at least 24 hours' advance notice.
 4. Submit separate reports for each test.
 5. Where authorities having jurisdiction do not have published procedures, perform tests as follows:
 - a) Sanitary Sewerage: Perform hydrostatic test.
 - b) Close openings in system and fill with water.
 - c) Purge air and refill with water.
 - d) Disconnect water supply.
 - e) Test and inspect joints for leaks.
 - f) Leaks and loss in test pressure constitute defects that must be repaired.
 - g) Replace leaking piping using new materials and repeat testing until leakage is within industry standard allowances.

END OF SECTION

SECTION 33 10 00 WATER UTILITIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Section 33 00 00 - Utility Lines

1.02 DESCRIPTION OF WORK

- A. Extent of exterior water system work is shown on drawings.
- B. Exterior water system work includes, but is not limited to, the following:
 - 1. Yard piping from public water main to within 5 feet of buildings and to private onsite fire hydrants.
 - 2. Control valves and fittings.
 - 3. Comply with requirements of applicable Division 2 sections for excavation and backfilling required in connection with exterior water system.
 - 4. Private fire hydrants.
 - 5. Excavation and backfilling for exterior fire protection system is specified in Mechanical General Provisions.
 - 6. Comply with requirements of applicable Division 2 sections for excavation and backfilling required in connection with exterior fire water system.
 - 7. Comply with requirements of applicable Division 3 sections for concrete work required in connection with exterior fire water system.

1.03 QUALITY ASSURANCE

- A. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect/Engineer with Certification that the material/product contains no asbestos. This certificate is mandatory before approval will be issued. Submittals furnished without the asbestos-free Certification will be returned to the Contractor with no action taken until such Certification is provided.
- B. Manufacturers: Firms regularly engaged in manufacture of water system materials of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- C. Installer: A firm with at least 2 years of successful installation experience on exterior fire water and domestic water system projects similar to this project and registered with the State as a certified Site Utility Contractor.

PART 2- PRODUCTS

REFER TO SECTION 33 00 00 – UTILITY LINES, FOR PIPE MATERIALS

2.01 CONTROL VALVES

- A. General: Provide valves and flow control devices which are approved by FM and listed by UL. B. Minimum working pressure, 150 psi unless otherwise indicated.
- C. Gate Valves: Standard shut-off valves with maximum working pressure cast into body, outside-screw-and-yoke type with non-rising stems complying with AWWA C 500 unless otherwise required by governing authorities.

2.02 WATER METER

- A. General: Provide water meter box and related piping conforming to applicable AWWA standards.
- B. Water Meter: Provided by contractor and installed by the SITE UTILITY CONTRACTOR. Provide roughing-in and bypass for meter in accordance with AWWA standards.

2.03 ANCHORAGES

- A. General: Provide anchorage's for tees, plugs, caps, bends and hydrants in accordance with

NFPA No.24.

1. After installation, apply a full coat of asphalt or other acceptable corrosion-retarding material to surfaces of rods and clamps.
2. Clamps, Straps and Washers: Steel, ANSI/ASTM A 506.
3. Rods: Steel, ANSI/ASTM A 575.
4. Rod Couplings: Malleable iron, and ANSI/ASTM A 197.
5. Bolts: Steel, ANSI/ASTM A 307.
6. Cast-Iron Washers: ANSI/ASTM A 126, Class A.
7. Thrust Blocks: 3000 psi concrete.

2.04 FIRE HYDRANTS

- A. General: Provide fire hydrant assemblies by manufacturers approved by AWWA. All new fire hydrants located in school property will be painted RED.

2.05 PLASTIC UNDERGROUND WARNING TAPE

- A. A polyethylene plastic tape, 4 inches wide by 4 mils. thick (min.). Tape shall be "safety precaution blue" in color for all plastic water piping (domestic and fire). Tape shall be laid 1'-0" below finish grade.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. General: Install exterior water line in compliance with applicable provisions of NFPA NO. 24, SAWS Specifications and as herein specified.
- B. PVC Pipe: Install PVC pipe, ductile iron pipe, ductile iron and cast iron fittings according to AWWA C600. Bury pipe to ensure a minimum cover of 4' below finished grade.
- C. Copper Tube: Install with wrought copper, solder joint pressure fittings, and Sn95 Tin-Antimony solder in accordance with CDA "Copper Tube" handbook.
- D. Control Valves: Install in accordance with manufacturer's instructions.
- E. Joint Adapters: Make joints between cast-iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.
- F. Interior Inspection: Inspect conduit to determine whether line displacement or other damage has occurred.
 1. If the inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects to satisfaction of Architect/Engineer.
- G. Cleaning Conduit; Clear interior of conduit of dirt and other superfluous material as work progresses.
 1. Place plugs in end of uncompleted conduit at end of day or whenever work stops.
 2. Flush lines to remove collected debris before connecting to other fire protection systems. Flush conduit at rates of flow recommended by NFPA No. 24 unless higher rates required by local authorities.
 3. Sterilization: At completion of water service line installation, flush and sterilize in conformance with AWWA C 601, to the satisfaction of local authorities having jurisdiction.

3.02 TESTING

- A. Perform hydrostatic testing of completed conduit lines in accordance with NFPA No. 24 unless more stringent test required by local authorities having jurisdiction.
- B. Perform operational testing of hydrants and valves by opening and closing under water pressure to insure proper operation.

END OF SECTION