SECTION 07 21 00

THERMAL INSULATION

PART 1  GENERAL

1.01  WORK INCLUDED

A. Spray polyurethane foam insulation.
B. Sound attenuation blankets in stud/gypsum board walls.
C. Aluminum faced insulation board on tilt-up concrete walls.

1.02  RELATED SECTIONS

B. Wood Nailers: Section 06 10 50.
C. Roof Insulation: Section 07 22 00.
D. Firestopping (Safing): Section 07 84 00.
E. Sustainable Design Requirements: Section 01 81 13.

1.03  SUBMITTALS

A. Product Data: Submit for all items.
B. Spray Foam Insulation Qualification Data: For qualified installer.
C. Submit for LEED Credit documentation.

1. Refer to Section 01 8113 “Sustainable Design Requirements” for additional LEED submittal requirements.

2. Product Data for Credit MRC4: For products having recycled content, provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating material costs for each product having recycled content.

3. Product data for Credit MRC5: For products having regional content:
   a. Provide documentation indicating location of manufacturer of product. If only a fraction of the material is manufactured regionally, indicate fraction as a percentage product’s total weight.
   b. Provide documentation indicating location of extraction, harvest or recovery of raw material in product. If only a fraction of the material is extracted, harvested or recovered regionally, indicated fraction as a percentage of product’s total weight.
c. Include statement indicating material costs for each product having regional content.

4. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building's weatherproofing system.

1.04 QUALITY ASSURANCE

A. Insulation Thermal Properties: Thermal conductivity k-factors and thermal resistance R-values indicated are values at 75 degrees F., mean temperature.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Spray Foam Insulation Installers: Trained and approved by manufacturer and with experienced in performing application of SPF materials on not less than five projects with similar quantities of sprayed insulation materials in similar applications.

1. Sample: A representative surface of not less than 100 sq. ft. shall be sprayed and approved before proceeding with spray insulation work.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver insulation materials in manufacturer's original, unopened, and labeled packages.

B. Store insulation materials at the site inside storage trailers or the building in a dry, ventilated place. Exterior storage not permitted. Comply with manufacturer's recommendations for handling and protection during installation.

C. Remove fibrous batt insulation that has become wet before or after installation. Replace with new, dry insulation.

D. Protect plastic insulation from excessive exposure to sunlight. Protect at all times against ignition. Complete installation and covering of plastic insulation materials as rapidly as possible in each area of work.

PART 2 PRODUCTS

2.01 SOUND ATTENUATION BLANKETS

A. Type: Unfaced semi-rigid mineral fiber or glass fiber blankets. Conform to ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

B. Thickness: 3 inch, unless otherwise indicated.
C. Manufacturer: Subject to compliance with requirements, provide products by JOHNS MANVILLE; THERMAFIBER, OWENS-CORNING FIBERGLAS, CERTAINTEED, ROXUL or FIBREX.

2.02 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Type

1. Material: ASTM C1029, Type III, closed cell polyurethane foam insulation containing no CFC’s, HCFC’s and VOC’s.
2. Physical Properties
   a. Density (ASTM D1622): Minimum 2.0 pcf
   b. Closed cell content (ASTM D6226): >90%
   c. Thermal Conductivity: R-Value = 6.4/inch. R-values are "aged" thermal values in accordance with PIMA Bulletin #101 and RIC/TIMA Bulletin #281-1 conditioning procedures
   f. Fire performance in accordance with ASTM E84 and UL 723 flame spread 25 or less and smoke development 450.
3. Thickness: As indicated or as required to fill voids where applicable.
4. Primer: Type as recommended by insulation manufacturer for adjacent and substrate surfaces. Ensure adjacent wall framing members are not deflected after installation and cure.
5. Where foam insulation is left exposed to building interior, provide approved 15 minute thermal or ignition barrier meeting the requirements of NFPA 286 and IBC Section 2603.4 (minimum ½” gypsum board, intumescent coating or similar code complying material).
   a. Bonding Agent: Provide suitable agent to ensure adequate bond between spray foam insulation and thermal barrier.
6. Manufacturers: Subject to compliance with specified requirements, provide products by HENRY, DOW, JOHN MANVILLE, BASF, CERTAINTEED, GACO-WESTERN or ICYNENE.

2.03 ALUMINUM FACED INSULATION BOARD

A. Polyisocyanurate Board Insulation with Facers Both Sides (for garage): Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 2, glass fiber-reinforced core. Designed specifically for tilt-up concrete walls.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Compressive Strength: 20 psi
5. Aluminum Facer: Embossed white acrylic coated aluminum sheet; 3.4 mil on the exposed side and 1.2 mil on the other side.
6. Board Edges: Square and wrapped with aluminum where edges are exposed.
7. Mounting: Corrosion resistant fasteners.
8. Tape: White foil; type as recommended by insulation manufacturer.
9. Manufacturers:
   a. Basis of Design: DOW CHEMICAL CO.; Thermax Heavy Duty Insulation,
   b. Other Manufacturers: Subject to requirements, insulation manufactured by CARLISLE COATINGS & WATERPROOFING, INC., GAF, HUNTER PANELS or JOHNS MANVILLE is acceptable.

2.05 ACCESSORY MATERIALS

A. Supplementary Support: Provide galvanized wire mesh, woven wire ties or flexible metal rods where required for supplementary support of insulation in permanent proper location.

B. Insulation Board Fasteners – Concrete/Masonry Back-Up: Similar to Plasti-Grip PMF (Plastic Masonry Fastener) with push-on poly washers. Size as required by insulation thickness.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine substrates and installation conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected.

B. Verify substrate surfaces are dry and free of irregularities or substances harmful to insulation. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

C. Verify mechanical and electrical services within walls have been installed and tested.

D. Spray-On and Spray Foam Insulations: Provide masking, drop cloths or other satisfactory coverings for all materials/surfaces which are not to receive insulation to prevent damage from overspray.

3.02 INSTALLATION OF BLANKET/BATT INSULATION

A. Install blanket type insulation with tight fitting butt joints. Provide supplementary support when required to maintain insulation in permanent proper location.

   1. Spot adhere insulation to inside face of exterior sheathing or similar back-up material as required to maintain insulation in it’s proper location.
B. Fit insulation between members.

C. Install interior wall sound attenuation at interior partitions where indicated on floor plans or wall types.

3.03 SPRAY FOAM INSULATION

A. Prepare surfaces as recommended by insulation manufacturer. Remove substances from metal deck or other metal surfaces that will prohibit insulation/metal bond. Apply primer where required by manufacturer.

B. Spray-Applied Insulation: Install Spray-application of polyurethane foam in accordance with ULC S705.2 and the manufacturer’s instructions. Install in areas where indicated on the drawings. Fill all voids for a complete solid installation.

C. Trim, as needed, any excess thickness that would interfere with the application of cladding/covering system by other trades.

D. Clean-up all overspray from adjacent surfaces and floor.

3.04 ALUMINUM FACED INSULATION BOARD

A. Place insulation between furring members; maintain tight joints between insulation panels and between insulation panels and furring members.

B. If required, use insulation manufacturer's suggested adhesive to bond the insulation panel to the wall.

C. Secure to concrete substrate with insulation board fasteners. Locate at 2’ on center.

D. See Section 07 42 13 for furring members.

E. Tape all joints, exposed and concealed, to provide a continuous vapor barrier seal. Center white foil tape over dry, clean edge joints. Use squeegee or stiff bristle brush to press the tape firmly to the joint. Cut tape with a knife, do not tear tape.

END OF SECTION
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SECTION 07 20 00

ROOF INSULATION

PART 1       GENERAL

1.01 SCOPE OF WORK
A. Roof insulation over the properly prepared deck substrate.

1.02 RELATED SECTIONS
A. Modified Bitumen Sheet Roofing: Section 07 52 16.
B. Flashing and Sheet Metal: Section 07 62 00

1.06 QUALITY ASSURANCE

A. Roofing Conference: Before starting roofing, conduct conference at Project site. Meet with the Architect and Manufacturer to review status of submittals and coordination of work related to roof construction. Notify participants at least 5 working days before conference.

1. Review methods and procedures related to roofing installation, including manufacturer’s written instructions.
2. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
3. Review flashings, roofing details, roof drainage, roof penetrations, equipment curbs, and conditions of other construction that will affect roofing.
4. Review temporary protection requirements for roofing system during and after installation.

B. Performance Requirements

1. Texas State Board of Insurance Windstorm Regulations.

1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer’s original containers, dry and undamaged.

B. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be removed from the project site.

C. Keep materials enclosed in a watertight, ventilated enclosure (i.e. tarpaulins).
D. Store materials off the ground. Any warped, broken or wet insulation boards shall be removed from the site.

**PART 2  PRODUCTS**

2.01  INSULATION MATERIALS

A. Thermal Insulation Properties and Approved Insulation Boards:

1. Rigid Polyisocyanurate Roof Insulation; ASTM C1289
   a. Qualities: Rigid, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
   b. Size: 4’ x 4’
   c. Thickness: Minimum 4” (2 layers of 2” staggered)
   d. R-Value: Minimum 5.68 per 1”
   e. Manufacturer: Subject to requirements, provide products manufactured by JOHNS MANVILLE, HUNTER PANELS, GAF or FIRESTONE

2. Tapered Polyisocyanurate Roof Insulation; ASTM C1289 (install tapered polyisocyanurate insulation at all roof drain locations and in all areas in order to form an 8’ o.c. drain sumps and all all locations indicated on the roof diagram in order to assure proper slope to roof drains):
   a. Qualities: Factory Tapered, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
   b. Tapered Slope: 1/4:12” drain sumps; ½:12” saddles and crickets
   c. Manufacturer: Subject to requirements, provide products manufactured by JOHNS MANVILLE (Value Therm), HUNTER, GAF (GAFTEMP Isotherm R) or FIRESTONE
   d. Insulation board shall meet the following requirements:
      1) UL, WH or FM listed under Roofing Systems
      2) Federal Specification HH-I-1972, Class 1

3. High Density Fiberboard Roof Insulation; ASTM C208 (Install in hot asphalt, staggered over the base layers of polyisocyanurate insulation)
   a. Qualities: Rigid, composed of interlocking fibers factory blended treated with asphalt on the top side.
   b. Board Size: 4’ x 4’, 4’ x 8’
   c. Thickness: Minimum ½”
   d. Manufacturer: Subject to requirements, provide products manufactured by CELOTEX, TEMPLE INLAND, GAF BUILDING MATERIALS CORPORATION, FIRESTONE or JOHNS MANVILLE.
   e. Insulation board shall meet the following requirements:
      1) UL, WH, FM listed under Roofing Systems.
      2) Federal Specification LLL-I-535-B.

2.03  RELATED MATERIALS

A. Fiber Cant and Tapered Edge Strips: Performed rigid insulation units of sizes/shapes indicated, matching insulation board or of perlite or organic fiberboard, as per the approved manufacturer.
1. Manufacturer: Subject to requirements, provide products manufactured by one of the following:
   a. CELOTEX
   b. JOHNS MANVILLE
   c. GAF
   d. HUNTER
   e. FIRESTONE

B. Asphalt: ASTM D-312, Type IV Special Steep Asphalt.

PART 3 EXECUTION

3.01 INSPECTION OF SURFACES

A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.

1. Verify that work which penetrates roof deck has been completed.
2. Verify that wood nailers are properly and securely installed.
3. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
4. Do not proceed until defects are corrected.
5. Do not apply insulation until substrate is sufficiently dry.
6. Broom clean substrate immediately prior to application.
7. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.

3.02 INSTALLATION

A. Attachment with Hot Asphalt (concrete deck).

1. Allow all concrete to cure a minimum of 30 days. Clean off all debris and loose bitumen bonded to the concrete roof deck, where applicable. Prime the concrete deck with asphalt primer at a rate of ½ gallon per 100 square feet and allow to dry.
2. Seal around all pipes, penetrations and cracks in the deck with roof cement and mesh reinforcement to avoid asphalt spillage into the building.
3. Install base layers of polyisocyanurate in 2 staggered layers of achieve a total thickness of 5”. Be sure to stagger all joints at least 18” between joints. Walk in all boards, twice, to assure proper adhesion.
4. Install new saddles, crickets and sumps around and between each roof drain. Install a 8’ x 8’ sump around each roof drain using tapered polyisocyanurate insulation. Install 1/2:12” tapered saddles in the drain valleys, where applicable per NRCA and NBC requirements.
5. Embed a ½” wood fiber recovery board in solid moppings of hot asphalt after the base layers of insulation have been properly installed. Stagger end joints of boards so all open joints will be eliminated. Walk in each piece of insulation and leave boards completely adhered to the first layer.
of insulation. Each insulation board shall be butt firmly against adjoining panels. All open joints shall be eliminated.

6. Install no more insulation at one time than can be roofed on the same day. Install temporary water cut-offs at completion of each day’s work and remove upon resumption of work.

7. Cant Strips/Tapered Edge Strips: Install preformed forty five (45) degree cant strips at junctures of vertical surfaces. Provide preformed, tapered edge strips at perimeter of edges of roof that do not terminate at vertical surfaces and/or indicated on the drawings. Tape joints of insulation as per manufacturer’s requirements.

3.03 CLEANING

A. Remove debris and cartons from roof deck. Leave insulation clean and dry, ready to receive roofing membrane.

END OF SECTION
PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide water drainage, exterior insulation and finish system (EIFS) Class PB system consisting of air/weather barrier, adhesive, rigid insulation, base coat, reinforcing mesh, and finish coat. Work includes:

1. Field applied exterior insulation and finish system applied over concrete tilt-up panels.
2. Accessories to complete the work.

1.02 RELATED SECTIONS

A. Joint Sealants: Section 07 92 00.
B. Exterior Gypsum Sheathing: Section 09 21 16.
C. Sustainable Design Requirements: Section 01 81 13.

1.03 PERFORMANCE REQUIREMENTS

A. EIFS Performance: Comply with the following

1. Bond Integrity: Free from bond failure within EIFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
2. Weathertightness: Resistant to water penetration from exterior into Rainscreen EIFS and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of EIFS and assemblies behind it, including substrates, supporting wall construction, and interior finish, and including a means that allows accommodate incidental moisture entering into an EIFS assembly to drain to the exterior.

B. Class PB EIFS: Provide EIFS having physical properties and structural performance that comply with the following:

1. Abrasion Resistance: Sample consisting of 1-inch-thick EIFS mounted on 1/2-inch-thick gypsum board; cured for a minimum of 28 days; and showing no cracking, checking, or loss of film integrity after exposure to 528 quarts of sand when tested per ASTM D968, Method A.
2. Absorption-Freeze Resistance: No visible deleterious effects and negligible weight loss after 60 cycles per EIMA 101.01.

3. Accelerated Weathering: Five samples per ICC-ES AC219 showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, delamination, or other characteristics that might affect performance as a wall cladding after testing for 2000 hours when viewed under 5 times magnification per ASTM G 153 or ASTM G 154.

4. Freeze-Thaw: No surface changes, cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination, or indications of delamination between components when viewed under 5 times magnification after 10 cycles per ICC-ES AC219.

5. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch clean glass substrate, cured for 28 days, and showing no growth when tested per ASTM D 3273 and evaluated according to ASTM D 3274.

6. Salt-Spray Resistance: No deleterious affects when tested according to ASTM B117 or ICC-ES AC235.

7. Tensile Adhesion: No failure in the EIFS, adhesive, base coat, or finish coat when tested per ICC-ES AC219.

8. Water Penetration: Sample consisting of 1-inch- thick EIFS mounted on 1/2-inch-thick gypsum board, cured for 28 days, and showing no water penetration into the plane of the base coat to expanded-polystyrene board interface of the test specimen after 15 minutes at 6.24 lbf/sq. ft. of air pressure difference or 20 percent of positive design wind pressure, whichever is greater, across the specimen during a test period when tested per EIMA 101.02.

9. Water Resistance: Three samples, each consisting of 1-inch- thick EIFS mounted on 1/2-inch- thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.

10. Impact Resistance: Sample consisting of 1-inch- thick EIFS when constructed, conditioned, and tested per EIMA 101.86; and meeting or exceeding the following:
   b. Medium Impact Resistance: 50 to 89 inch-lb.
   c. High Impact Resistance: 90 to 150 inch-lb.

11. Drainage: According to ASTM E2273

   a. Texas State Board of Insurance Windstorm Regulations.

1.03 SUBMITTALS

A. Product Data: Submit for all items.

B. Submit for LEED Credit documentation.

1. Refer to Section 01 81 13 “Sustainable Design Requirements” for additional LEED submittal requirements.
2. **Product Data for Credit IEQ 4.1:** For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

C. **Shop Drawings:** Include plans, elevations, sections, details of components, details of penetration and termination, flashing details, joint locations and configurations, fastening and anchorage details and connections and attachments to other work.

   1. Coordinate control joint locations with Architect; include locations on Shop Drawings elevations.

D. **Samples for Initial Selection:** For each type of finish-coat color and texture indicated. Include joint sealant samples for color selection. Submit EIFS samples and sealant colors in the same submittal.

E. **Samples for Verification:** Submit minimum 12” x 12” samples mounted on exterior grade sheathing board for complete system components and finish color and texture selection. Include metal stud segment to indicate mechanical attachment.

   1. Include one control joint in sample board with sealant to verify color selected.

F. **Manufacturer's certificate of compliance with referenced EIMA Standards.**

G. **Manufacturer’s certification of compliance with Texas Department of Insurance criteria.**

H. **Compatibility and Adhesion Test Reports:** For joint sealants from sealant manufacturer indicating the following:

   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

I. **Provide manufacturer's written maintenance instructions.**

1.05 **QUALITY ASSURANCE**

A. **System Components:** Produced by the manufacturer or by manufacturers approved by the system manufacturer.

B. **Installation:** Performed by the system manufacturer or an applicator trained and approved by the system manufacturer. During application, the work shall be inspected by system manufacturer’s representative.

   1. Minimum 3 years experience installing EIFS Systems.
C. Sample panel: Provide a sample wall panel not less than 4'-0" by 4'-0" in size, showing selected color, workmanship, and finish texture proposed for the work. Sample panel shall contain all materials and components of the full scale work. Location as directed by the Architect. Sample panel may be a portion of the work and, when accepted by the Architect, remain in place.

D. Fire-Test-Response Characteristics: Provide EIFS and system components with the following fire-test-response characteristics as determined by testing identical EIFS and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.


2. Full-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, complies with UBC Standard 26-4 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies containing foam-plastic insulation.

3. Full-Scale Diversified Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, showing no significant contribution to vertical or horizontal flame spread per ASTM E108 modified for testing vertical walls.

4. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies containing foam-plastic insulation.

5. Radiant Heat Exposure: No ignition of EIFS when tested according to NFPA 268.

6. Potential Heat: Acceptable level when tested according to NFPA 259.

7. Surface-Burning Characteristics: Provide insulation board, adhesives, base coats, and finish coats with flame-spread index of 25 or less and smoke-developed index of 450 or less, per ASTM E84.

E. Preinstallation Conference: Conduct conference at project site. Include Owner’s Representative, Architect, Contractor and installer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s original, unopened and labeled packages or containers.

B. Store, handle, and protect materials in accordance with manufacturer’s recommendations.
C. Protect plastic insulation from excessive exposure to sunlight. Protect at all times from ignition. Complete installation and covering of plastic insulation materials as rapidly as possible in each area of work. Stack insulation board flat and off the ground.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Comply with manufacturer’s requirements before, during and after adhesives and coatings are applied. Do not apply EIFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers’ written instructions.

B. Protect adjacent materials and surfaces from damage and soiling during system installation.

C. Framing to receive the gypsum sheathing panels shall be structurally sound, free from bow and in general compliance with local building code requirements. Damaged and/or bowed framing shall be replaced before installation of the gypsum sheathing panels.

1.08 COORDINATION

A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, weather-resistant barrier, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing and barrier coating of EIFS.

1.09 WARRANTY

A. Manufacturer: Provide warranty providing repair or replacement of materials and workmanship from defects arising from material failure including; but not limited to, excessive fading or color change, surface defects such as cracking or crazing, seepage and leakage of water or excessive moisture into the building or wall cavities through a material defect in the water drainage EIFS system for a period of five (5) years from date of Substantial Performance.

B. Installer: Provide warranty providing repair or replacement of materials and workmanship from defects arising from defective workmanship including, but not limited to, seepage and leakage of water or excessive moisture into the building or wall cavities through improper material mixing or material curing, failure to provide proper protection or installation within temperature limitations for a period of two (2) years from date of Substantial Performance.
PART 2 PRODUCTS

2.01 MANUFACTURERS

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

1. DRYVIT SYSTEMS INC.
2. STO CORPORATION
3. PAREX.
4. TOTAL WALL INC.
5. BASF/SENERGY

2.02 MATERIALS

A. Compatibility: Provide adhesive, fasteners, board insulation, reinforcing meshes, base- and finish-coat systems, sealants, and accessories that are compatible with one another and with substrates and approved for use by EIFS manufacturer for Project.

B. Primer/Sealer: EIFS manufacturer's standard substrate conditioner designed to seal substrates from moisture penetration and to improve the bond between substrate of type indicated and adhesive used for application of insulation.

1. VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24),

C. Air/Water-Resistive Barrier: EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.

D. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; compatible with substrate and complying with the following:

1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, and polymerbased adhesive specified for base coat.
2. VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)
3. Wind design load indicated.

E. Molded, Rigid Cellular Polystyrene Board Insulation: Comply with ASTM C 578, Type I; EIFS manufacturer's requirements; and EIMA's "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:

1. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.
2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.
3. Dimensions: Provide insulation boards not more than 24 by 48 inches and in thickness indicated, but not more than 4 inches thick or less than thickness allowed by ASTM C 1397.
4. Drainage Cavities: EIFS manufacturer’s standard channeled insulation or channels created by vertical adhesive

F. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. per ASTM E 2098; complying with ASTM D 578 and the following:

1. Standard-Impact Reinforcing Mesh: Not less than 4.0 oz./sq. yd.
2. High-Impact Reinforcing Mesh: Not less than 20.0 oz./sq. yd.
3. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd.
4. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd.

G. Base-Coat Materials: EIFS manufacturer's standard mixture complying with the following:

1. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.

H. Waterproof Adhesive/Base-Coat Materials: EIFS manufacturer's standard waterproof formulation and complying with one of the following:

1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with Portland cement.
2. VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

I. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat. Provide when recommended by manufacturer.

J. Finish-Coat Materials: EIFS manufacturer's standard acrylic-based coating with enhanced mildew resistance complying with the following:

1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
2. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.
3. Colors: Custom; match tilt up concrete panel color as selected by Architect.

K. Water: Potable.
L. Mechanical Fasteners: EIFS manufacturer's recommended corrosion-resistant fasteners consisting of thermal cap, standard washer and shaft attachments, and fastener indicated below; selected for properties of pullout, tensile, and shear strength required to resist design loads of application indicated; capable of pulling fastener head below surface of insulation board; and of the following description:

1. For attachment to steel studs from 0.033 to 0.112 inch in thickness, provide steel drill screws complying with ASTM C 954.
2. For attachment to light-gage steel framing members not less than 0.0179 inch in thickness, provide steel drill screws complying with ASTM C 1002.

M. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D1784, manufacturer's standard Cell Class for use intended, and ASTM C 1063.

1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
2. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
3. Expansion Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.
4. Window Sill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.
5. Drainage Strip: Corrugated plastic sheet material for use where full backwrapping of horizontal termination edges is selected or required.
6. Parapet Cap Flashing: Type for both flashing and covering parapet top with design complying with ASTM C1397.

N. Elastomeric Sealant Products: Provide EIFS manufacturers listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in ASTM C 1481 and with requirements in Section 07 92 00 "Joint Sealants" for products corresponding to description indicated below:

1. Multicomponent, nonsag urethane sealant.
2. Single-component, nonsag, neutral-curing silicone sealant.
3. Sealant Color: Custom; as selected by Architect to match EIFS.
4. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2.04 MIXES

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

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.

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

1. Begin coating application only after surfaces are dry.

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

3.02 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind EIFS and deterioration of substrates.

C. Prepare and clean substrates to comply with EIFS manufacturer’s written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.03 EIFS INSTALLATION, GENERAL

A. Comply with ASTM C1397 and EIFS manufacturer’s written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.04 SUBSTRATE PROTECTION APPLICATION

A. Primer/Sealer: Apply over gypsum sheathing substrates to protect substrates from degradation and where required by EIFS manufacturer for improving adhesion of insulation to substrate.
B. Water-Resistive Coatings: Apply over substrates to protect substrates from degradation and to provide water-/weather-resistive barrier.

1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing unless otherwise indicated by EIFS manufacturer's written instructions.

C. Flexible-Membrane Flashing: Install over weather-resistive barrier, applied and lapped to shed water; seal at openings, penetrations, terminations, and where indicated by EIFS manufacturer's written instructions to protect wall assembly from degradation. Prime substrates, if required, and install flashing to comply with EIFS manufacturer's written instructions and details.

D. Waterproof Adhesive/Base Coat: Apply over sloped surfaces, window sills and parapets protect substrates from degradation.

3.05 TRIM INSTALLATION

A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, and elsewhere as indicated, according to EIFS manufacturer's written instructions. Coordinate with installation of insulation.

1. Drip Screed/Track: Use at bottom edges of EIFS unless otherwise indicated.
2. Casing Bead: Use at other locations.
3. Parapet Cap Flashing: Use where indicated on Drawings.

B. Install flashings and drainage accessories over Air/moisture Barrier at all openings, penetrations, and other locations as recommended by EIFS manufacturer, to comply with EIFS manufacturer's instructions.

3.06 INSULATION INSTALLATION

A. Insulation: Adhesively and mechanically attach insulation to substrate in compliance with ASTM C1397 and EIFS manufacturer's written instructions and recommendations. In addition include the following:

1. When applicable, apply adhesive as recommended by manufacturer to maintain channeled adhesive design.
2. Interrupt insulation for expansion joints where indicated.
3. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch.
   a. Cut and/or routed joints shall be marked in field and approved by Architect prior to performing routing operations.
   b. Off-set reveals a minimum 3" from insulation board joints.
4. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches wide or 6 inches high. Offset joints not less than 6 inches from corners of window and door openings.
   a. Adhesive Attachment: Offset joints of insulation not less than 6 inches from horizontal and 4 inches from vertical joints in sheathing.
   b. Mechanical Attachment: Offset joints of insulation from horizontal joints in sheathing.

5. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.

6. Treat exposed edges of insulation as follows:
   a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
   b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
   c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.

8. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and EIFS protective-coating lamina.

B. Expansion Joints: Install at locations indicated and where required by EIFS manufacturer.

3.06 BASE-COAT INSTALLATION

A. Base Coat: Apply to exposed surfaces of insulation in minimum thickness recommended in writing by EIFS manufacturer, but not less than 1/16-inch dry-coat thickness.

B. Reinforcing Mesh: Embed type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.

1. Standard-impact reinforcing mesh: Over 10 feet above grade, unless otherwise noted.
2. High-impact reinforcing mesh: Up to 10 feet above grade, unless otherwise noted.
C. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip reinforcing mesh diagonally at corners of openings (reentrant corners). Apply 8-inch wide strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.

1. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches wide.
2. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.

3.07 FINISH COAT INSTALLATION

A. Primer: Apply over dry base coat according to EIFS manufacturer’s written instructions.

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

1. Texture: As selected by Architect from manufacturer’s full range.

3.08 INSTALLATION OF JOINT SEALANTS

A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Section 07 92 00 "Joint Sealants" and in ASTM C1481.

1. Clean surfaces to receive sealants to comply with indicated requirements and EIFS manufacturer’s written instructions.
2. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
3. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.
4. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.

3.09 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections as stipulated in IBC Chapter 17.

3.10 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.
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PART 1  GENERAL

1.01  WORK INCLUDED

A. Prefinished, vertically installed, steel wall panel liner system consisting of panel, Z-girts, trim and sealant work for a complete installation.

1.02  RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

1.03  REFERENCES


1.04  SUBMITTALS

A. Shop Drawings: Submit for all items. Include the following:

1. Panel profile and gage.
2. Erection layout.
3. Wall openings.
4. Special framing details.

B. Manufacturer’s product specifications, standard details, certified product test results, installation instructions and general recommendations as applicable to materials and finishes for each component and for total system of preformed panels.

C. Samples: Submit minimum 9" long by full width sample of panel showing finish, pattern, color, gage and profile.

1.05  QUALITY ASSURANCE

A. Manufacturer assumes undivided responsibility for all components of metal panel work with not less than 5 years successful experience in fabrication and installation of metal panel systems similar to work of this project.
B. Qualifications of Installer: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section. The firm shall have not less than 5 years of successful experience in erection of metal panel systems similar to system required for this project.

1.06 HANDLING AND STORAGE

A. Exercise care so as not to damage or deform material.

B. Stack on platforms or pallets and cover to protect from weather.

C. If an anti-stick compound or ply is used it shall be readily removable and not adversely affect the finish surfaces.

1.07 WARRANTY

A. Prior to initial payment, metal wall panel manufacturer shall furnish the Owner with a written manufacturer's warranty certifying that all wall panel work was furnished and installed in complete accordance with the Contract Documents.

B. Manufacturer's warranty shall certify that the installation will be free of defects in design and failures of materials, and construction and shall be warranted against leakage for a period of 5 years from the date of completion.

1. Failure of materials or workmanship includes air infiltration, excessive deflections, deterioration of finish or construction in excess of normal weathering, and defects in joint sealants, and other components of the work.

C. Finish: Warranted for 10 years from date of substantial completion against:

1. Color change more than 5 NBS units as determined in accordance with procedures set forth in ASTM D2244.
2. Crack, peel or otherwise lose adhesion, the term "crack" not to include minute facing defects which may occur during fabrication of the coating building products.
3. Chalk in excess of ASTM rating #8; the chalk rating to be determined in accordance with procedures outlined in ASTM D4214.

D. Should defects development during the warranty period, such defects will be repaired by the metal panel manufacturer at no expense to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Metal Liner Panels: Solid panels formed with two vee-grooves between panel edges; with a flush joint between panels.
1. Material: Smooth galvanized steel conforming to ASTM A653, SS Grade 50, minimum yield stress of 50,000 psi, structural quality galvanized coating, designation G90.

2. Description
   a. Thickness: 0.028” minimum.
   b. Depth: 1-3/8”.
   c. Side Joints: Concealed fastener type.

B. Manufacturers: Subject to requirements, panels manufactured by CENTRIA, BERRIDGE, FABRAL, METAL SALES MANUFACTURING CORPORATION or MORIN are acceptable.

C. Accessories
   1. Mounting Angles: Provide horizontal structural “Z’s” min. 16 gage G-90 galvanized, spacing and gage to be determined by panel manufacturer. Z girts shall accommodate rigid insulation boards to be installed between Z’s, coordinate Z spacing with insulation board widths.
   2. Trim: Same material, gage and finish as adjacent panel material.

D. Fasteners: Manufacturer’s standard items, conforming to the following minimums:
   1. Material: Type 305 stainless steel.
   2. Length: As required for siding.

2.02 FINISHES

A. Panels and Trim
   1. Exposed Surfaces
      a. 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.
      b. Color: As selected by Architect from manufacturer’s complete line.
   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.

2.03 FABRICATION

A. General: All components of metal wall panel system shall be of the materials, design, sizes and thickness shown on approved shop drawings and/or specified herein.

B. Joints in Metal Work: Carefully match all exposed work to produce continuity of line and design, with all joints, unless otherwise shown or specified, being accurately fitted and rigidly secured.

C. Protection of Metals: Provide protection against galvanic action wherever non-compatible metals are in contact.
PART 3 EXECUTION

3.01 INSPECTION

A. After lines and grades have been established, and before beginning installation, examine all parts of the structure affecting the installation of the metal siding panels. Should conditions be found which, in installer's opinion, will prevent the proper execution of the metal siding panel work, installer shall report such conditions, in writing, to the Contractor.

B. Installation work shall not proceed in that area until such conditions are corrected.

3.02 INSTALLATION

A. Panels

1. Install in accordance with manufacturer's instructions and recommendations.
2. Erect sheets true and plumb, in alignment with horizontal and vertical edges of the building. Final appearance of the wall shall be visually flat, straight and free from defect.
3. Seal all panel-panel, panel/trim, and accessory/panel joints to provide resistance to specified water penetration.

B. Trim: Provide extruded trim at corners, openings, panel terminations, and other areas indicated.

3.03 ERECTION TOLERANCES

A. Provided the clearances shown on approved shop drawings are maintained and supporting substructure is installed to proper tolerances, all parts of the metal siding system, when completed, shall be within the following tolerances:

1. Maximum variation from plane or location shown on approved shop drawings: 1/4" per 12' of length, or 1/2" in any total length.
2. Maximum offset from true alignment between two identical members abutting end-to-end in line: 1/8".

3.04 DAMAGED PANELS

A. Do not install panels that are bent, chipped, or otherwise damaged.

B. Refinish all abraded surfaces to match original finish, using materials and methods recommended by siding manufacturer. Materials shall be fully compatible with the original finish system.

C. Repaired surfaces shall be uniform and free from variations in color and surface texture from that of adjacent, like surfaces.

D. If repaired sheet is not acceptable to the Associate, remove sheet and replace with a new sheet, at no additional cost to the Owner.
3.05 REMOVAL OF DEBRIS

A. All debris caused by or incidental to the installation work shall be removed from the jobsite as the work progresses. Waste debris will not be permitted to accumulate.

3.06 CLEANING AND PROTECTION

A. Cleaning: Clean finished surfaces as recommended by panel manufacturer, and in accordance with Section 01 74 00 requirements.

1. Clean siding surfaces of dirt, grime and other surface blemishes.

B. Protection: Installer shall advise Contractor of protection and surveillance procedures, as required to ensure that work of this section will be without damage or deterioration at time of substantial completion.

END OF SECTION
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SECTION 07 42 44

METAL COMPOSITE MATERIALS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services necessary for the installation of a preformed metal wall panel system, complete and weather tight. Work shall include but not be limited to panels, stiffeners, fasteners, and weather seals required for a complete installation of panels to the support system provided for this scope of work.

1. Furnish and install a preformed, prefinished composite wall panel system
2. Accessory items such as panel subgirt system, clips, flashings, sealants, and gaskets.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 8113.

1.03 METAL PANEL SYSTEM DESCRIPTION

A. Provide metal composite metal panel system, complete with required stiffeners and internal weather seals shall meet the specified requirements for air infiltration, water penetration, and seismic/structural performance as specified and per building codes.

1.04 DESIGN AND PERFORMANCE CRITERIA

A. Preformed metal wall panel system: Meet the minimum performance standards specified within this Section

B. Metal panel system: Designed by manufacturer so that attachment allows panels to successfully accommodate seismic and thermal movement without causing "oil-canning", undue stress on fasteners, or failure of weather seals.

C. Structural Performance: Provide metal-faced composite wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330 "Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference:"

2. Deflection Limits: Metal-faced composite wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span.
D. 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:


E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:


F. Dynamic Water Penetration: Panel system shall have been tested in accordance with AAMA 501 and shall have passed with no uncontrolled water leakage at 6.24 psf dynamic pressure differential for a 15 minute duration, with water application rate of 5 gal/ft2/hr.

G. Fire Performance

1. ASTM E 84 Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450.
2. ASTM D 1929 A self ignition temperature of 650°F or greater

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum of (5) years experience in the design and manufacturing of preformed metal wall panel systems with a minimum of (3) projects of similar size and scope of this project, utilizing this type of dry-joint composite panel system.

B. Single Source Quality Control - Metal panel system manufacturer: Provide all design, engineering, panel fabrication, and assembly of panel system in manufacturing facility.

C. Installer Qualifications: Minimum of (5) years experience in the installation of the specified panel system type, and be an authorized installer of the preformed metal panel system manufacturer.

D. Metal Panel System Tolerances

1. Maximum panel bow shall not exceed 2% of panel dimensions in width or length, with an overall maximum tolerance of .1875” within panel face.
2. Face of panel shall not vary in plane to any adjacent panel greater than 1/16”.
3. Maximum 1/32” between mitered panel extrusions.

E. Painted Finishes: Performed by an applicator specifically approved by the paint manufacturer. The applicator shall provide written notification of approval by paint manufacturer prior to application of the finish.
1.06 SUBMITTALS

A. Manufacturer’s Certification: Submit written certification that metal panel system manufacturer has a minimum of (5) years experience in the design, engineering, and manufacturing of the type of panel system specified. Submit (3) reference projects of similar size and scope utilizing the specified type of panel system.

B. Samples: Submit physical samples as follows

1. (4) 12” square panels mounted with specified system attachments, paint finish for composite panel and for perimeter extrusion
2. (6) standard color charts for specified silicone sealant manufacturer

C. Shop Drawings: Submit complete metal panel system shop drawings with keyed plans, elevations, and sections. Specific details shall be included for all panel conditions and all interfaces with all other exterior wall systems. Included coordinated details from shop drawings for other exterior wall systems. Drawings shall also indicate method of attachment, location of internal stiffeners and weather seals, and drainage method for perimeter extrusion system.

D. Structural Calculations: Submit structural calculations for the design and performance of the metal panel system, including specified and building code windloads, deflections, in-place stresses, and capacity of fasteners. Calculations and submittal drawings shall be stamped by a Professional Engineer licensed in the State Of Texas.

E. Sealant Adhesion Testing: Submit sealant manufacturer’s adhesion test results and recommendations for surface preparation to fluoropolymer paint finish.

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material 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 Contract Completion.

B. Special Warranty on Panel Finishes: Manufacturer’s standard form in which manufacturer agrees to repair finish or replace metal composite material 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.
2. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/FABRICATORS


B. Panel System Fabricators/Installers: Provide rout and return dry-joint metal composite system designed and fabricated by the metal panel systems specified in paragraph 2.01A or by fabricators certified by the panel manufacturers. All panel fabricators’ systems must meet the specified design and performance requirements and conform to the design intent indicated on the drawings.

2.02 MATERIALS

A. Panels: General Description: Two sheets of alloy AA3000 Series aluminum (0.019" thick) sandwiching a non-combustible core of extruded thermoplastic formed in a continuous process.

1. Thickness: .157" nominal.
2. Weight: 1.16 lbs/sf
3. Tolerances
   a. Panel Bow: Maximum 0.8% of any 72" panel direction.
   b. Deviation from Flatness: Maximum 1/8" in 60" in any direction for assembles unit; non-accumulative.

B. Panels shall have formed returns inserted into continuous perimeter extrusion, sealed, reinforced, and adhered to panel with structural silicone sealant.

C. Metal Panel Subgirt System: Where indicated, provide 16 gauge-galvanized profile as subgirt system for panel attachment.

D. Fasteners: Subgirt and panel fasteners shall be non-corrosive type as recommended by panel system manufacturer. Size and spacing shall be as required by structural calculations.

E. Perimeter Extrusions: Provide extruded aluminum profiles with finish matching composite panels.

F. Weather seals: System Type: Rout and Return Dry: System must provide a perimeter aluminum extrusion with integral EPDM or neoprene weather seals. No field sealant permitted in joints unless indicated on drawings. Where indicated, provide silicone type as recommended by system manufacturer; color to match panels as approved by Architect.
2.03 PAINT FINISHES

A. Finishes

1. Exterior Face Sheet: Fluoropolymer finish containing not less than 70% PVDF (Kynar 500) resins; "Trinar" by AKZO; "Duranar" by PPG; "Fluropon" by VALSPAR. Total dry film thickness not less than 1.0 mils, or coatings meet or exceed the requirements of AAMA 2605.
   a. Color: Custom color as selected by Architect.
2. Application: Apply coating systems in strict accordance with manufacturer's printed instructions and recommendations.
3. Strippable coating shall be clear color, 2-1/2 mils thick, applied to all exterior face sheet materials after finish painting and prior to embossing and roll forming.
4. Interior Face Sheet: White polyester paint suitable for field finish painting.
5. Trim: Extruded aluminum; finish to match panels.

B. To optimize panel finish uniformity, complete exterior panel elevations shall be finished from the same paint batch, in the same production run, utilizing directional arrows for consistency of application.

PART 3 EXECUTION

3.01 PRE-INSTALLATION CONFERENCE

A. Not less than two weeks before starting installation of materials in the section, the contractor will convene a meeting at project site with Architect, Construction Manager, Owner's representative, Contractor installer foreman/superintendent, material manufacturer's representative, and mechanical and electrical trades. Review project requirements, required submittals, status of substrate work, areas of potential conflict and interference, availability of materials, installer's personnel, equipment and facilities, construction schedule, weather and forecasted weather conditions, and coordinate methods, procedures and sequencing requirements for proper installation, integration and protection of the work.

3.02 FABRICATION

A. Fabricate panels to sizes and configurations as indicated on drawings. All panel joints shall occur exactly where indicated on drawings

B. Panels shall be formed, with perimeter extrusions applied with silicone sealant and mechanical screw attachment.

C. Panel stiffeners required for flatness and deflection shall be applied to the panel with structural silicone and compatible glazing tape.

D. Field fabrication of composite panels is not permitted.
3.03 INSTALLATION

A. Panel system installer shall be authorized by the metal panel system manufacturer and familiar with the specific details required for this project.

B. Provide at least (1) person to be present at all times who is capable of providing layout for the metal panel system. Notify Architect of any dimensional discrepancies that may affect panel system installation.

C. Install metal panel system in accordance with fabricator’s instructions and recommendations and the approved shop drawings for the project.

D. Install panel system to subgirt system with specified fasteners and within specified tolerances for joinery, level, and plumb.
   1. Maximum offset from true alignment of adjacent panels installed butting or in line shall by 1/16”.
   2. Panel to panel joints shall not vary greater than 1/16” of the joint size indicated on drawings.

END OF SECTION
PART 1   GENERAL

1.01   SECTION INCLUDES
A. Modified bituminous membrane roofing and insulation over prepared substrate.

1.02   RELATED SECTIONS
A. Wood Blocking: Section 06 10 50.
B. Roof Insulation: Section 07 20 00.
C. Flashing and Sheet Metal: Section 07 62 00.
D. Sustainable Design Requirements: Section 01 81 13.
E. Thermoplastic Polyolefin Roofing – Canopies: Section 07 54 23.

1.03   SUBMITTALS
A. Shop Drawings: Submit for all items. Include as a minimum the following:
   1. Layout of roof.
   2. Setting plans for tapered insulation.
   3. Location and type of penetrations.
   4. Perimeter, penetration and special details.
   5. Conformance to fire classifications requirements of IBC 1505.
B. Samples: Submit samples of all roofing and flashing materials and walkways; 12" square samples of membrane indicating color and thickness.
C. Submit certification from roofing manufacturer that:
   1. Roofing membrane and the selected roofing insulation are compatible.
   2. Specifications and drawing details are acceptable for the deck and surfacing materials to which materials are to be applied.
   3. Installer is trained and approved for this type of installation.
   4. Roof system is adhered properly to meet or exceed the requirements of the specified FM requirements.
   5. Meet all Texas Department of Insurance submittal requirements.
D. LEED Submittals
1. Product Test Reports for Credit SS 7.2: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirement.

2. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

E. Manufacturer’s inspection reports.

F. Certification that the modified bitumen membrane contains 27% pre consumer and 8% post consumer recycled content.

G. Certification that the roof system meets or exceeds all necessary wind uplift calculations as performed by the roof system manufacturer’s engineer’s to meet ASCE 7-10. ASCE 7-10 wind uplift parameters.

1.04 QUALIFICATIONS

A. Installer: Company specializing in modified bituminous roofing installation with a minimum five (5) years experience and certified by roofing system manufacturer as qualified to install manufacturer’s roofing materials.

B. Installer’s Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work and at any time roofing work is in progress. Maintain proper supervision of workmen. Maintain a copy of the specifications in the possession of the Supervisor/Foremen and on the roof at all times.

C. Immediately correct roof leakage during construction. If the Contractor does not respond within twenty four (24) hours, the Owner has the right to hire a qualified contractor and backcharge the original contractor.

1.05 QUALITY ASSURANCE

A. Roofing Conference: Before starting roofing, conduct conference at Project site. Meet with the Architect and Manufacturer to review status of submittals and coordination of work related to roof construction. Notify participants at least 5 working days before conference.

1. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

2. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.

3. Review flashings, roofing details, roof drainage, roof penetrations, equipment curbs, and conditions of other construction that will affect roofing.

4. Review temporary protection requirements for roofing system during and after installation.

B. Performance Requirements
1. Texas State Board of Insurance Windstorm Regulations.
2. See Structural Drawings for Wind Load requirements for the project.
   Note: Requirements are higher than local code minimum requirements.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin or other breathable material (not polyethylene).

C. Do not leave unused materials on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.

D. It is the responsibility of the contractor to secure all material and equipment on the job site. If any material or equipment is stored on the roof, the contractor must make sure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the contractor will be the sole responsibility of the contractor and will be repaired or replaced at his expense.

1.07 MANUFACTURER'S INSPECTIONS

A. When the project is in progress, the roofing system manufacturer will provide the following:

1. Keep the Owner informed as to the progress and quality of the work as observed.
2. Provide job site inspections daily during days in which the contractor is performing the roof installation.
3. Report to the Owner in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor’s attention.
4. Confirm after completion that manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.08 PROJECT CONDITIONS

A. Weather Condition Limitations: Do not apply roofing membrane during inclement weather or when a 40% chance of precipitation is expected.

B. Do not apply roofing insulation or membrane to damp deck surface.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
D. All slopes of greater than 1-1/2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral shank one (1) inch cap nails, or screws and plates at a rate of one (1) fastener per ply (including the modified membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and four (4) ft o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 1 1/2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install four (4) additional fasteners at the upper edge of the modified bitumen sheet when strapping the plies.

1.09 SEQUENCING AND SCHEDULING
A. Sequence installation of modified bituminous sheet roofing with related units of work specified in other sections to ensure that roof assemblies including roof accessories, flashing, trim and joint sealers are protected against damage from effects of weather, corrosion and adjacent construction activity.

B. Fully complete all modified bituminous membrane roofing field assembly work each day. Phased construction will not be accepted.

1.10 WARRANTY
A. Roofing Manufacturer: Upon completion of the project, provide the Owner with a 30 year No Dollar Limit labor and material warranty. The warranty shall cover all labor, materials, sheet metal coping, materials provided by others and wind speeds up to 90 miles per hour.

B. Roofing Contractor: Provide a 2 year labor warranty to the Owner and the roofing system manufacturer upon completion of the project.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Basis of Design: Specifications are based on roofing system manufactured by GARLAND.

B. Other Manufacturers: Subject to compliance with the specified requirements, roofing systems manufactured by the following are acceptable:

1. TREMCO
2. SOPREMA
3. DERBIGUM
4. FIRESTONE

2.02 DESCRIPTION
A. Modified bituminous roofing work including but not limited to:
1. Hot Bitumen: ASTM D312, Type IV special steep asphalt having the following characteristics:
   a. Softening Point: 210°F - 225°F
   b. Flash Point: 500°F
   c. Penetration @ 77°F: 15-25 units
   d. Ductility @ 77°F: 1.5 cm
2. Base Field and Base Flashing Ply: One (1) ply of SBS modified 80 mil Fiberglass base sheet covered by an additional layer of modified bitumen membrane and set in bitumen. Provide products as manufactured by:
   a. Commercial Innovations or approved equal.
3. Modified Membrane: Environmentally Friendly; 80 mil, rubber modified roofing membrane incorporating 27% pre consumer and 8% post consumer recycled content and reinforced with a dual fiberglass/polyester scrim. Provide products as manufactured by:
   a. THE GARLAND COMPANY, INC.
4. Surfacing: White, fire resistant, acrylic coating with an Energy Star approval as required by the warranting roof system manufacturer.

2.03 BITUMINOUS MATERIALS

A. Asphalt Primer: V.O.C. compliant, ASTM D41.

B. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D2822, Type II.

C. Interply Adhesive: ASTM D312, Type IV. Provide products as manufactured by:

   1. TRUMBULL
   2. CONTINENTAL

2.04 SHEET MATERIALS

A. Base Field and Base Flashing Ply

   1. 80 mill, SBS modified fiberglass scrim with the following minimum performance requirements according to ASTM D5147.

      Properties (Finished Membrane):
      Tensile Strength (ASTM D2523)
      2 in/min. @73.4 +/- 3.6°F MD 90 lbf/in CMD 90 lbf/in
      Tear Strength (ASTM D4073)
      2 in/min. @ 73.4 +/- 3.6°F MD 100 lbf CMD 100 lbf
      Elongation at Maximum Tensile (ASTM D2523)
      2 in/min. @ 73.4 +/- 3.6°F MD 3.0% CMD 3.0%

B. Modified Membrane Field and Flashing Ply

   1. Modified Membrane Properties (Finished Membranes):
STRESSPLY EUV; ASTM D6162, Type III Grade S

Tensile Strength (ASTM D5147)
2 in/min. @ 73.4 +/- 3.6°F MD 300 lbf/in CMD 300 lbf/in

Tear Strength (ASTM D5147)
2 in/min. @ 73.4 +/- 3.6°F MD 500 lbf CMD 500 lbf

Elongation at Maximum Tensile (ASTM D5147)
2 in/min. @ 73.4 +/- 3.6°F MD 3.5% CMD 3.5%
50 mm/min. @ 23 +/- 3°C

Low Temperature Flexibility (ASTM D5147): Passes -30°F

Post Consumer Recycled Content 8%
Pre Consumer Recycled Content 27%

2.05 FINAL ROOF SURFACING

A. Pyramic white, fire resistant acrylic coating

Weight/Gallon 12 lbs./gal. (1.44 g/cm3)
VOC Less than 50 g/l
Reflectance .84
Emittance .91
SRI 106

2.06 RELATED MATERIALS

A. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel. Fasteners shall be self-clinching type of penetrating type as recommended by the manufacturer of the deck material. Nails and fasteners shall be flush-driven through flat metal discs of not less than one (1) inch diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than one (1) inch diameter are used.

B. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than twenty eight (28) gauge and not less than one (1) inch in diameter. Form discs to prevent dishing. Bell or cup shaped caps are not acceptable.

C. Walkway Pads: As recommended and furnished by the membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck surfaces and project conditions are ready to receive work of this section.
3.04 GENERAL ROOFING INSTALLATION REQUIREMENTS

A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the roof system.

B. Insurance/Code Compliance: Where required by code, install and test the roofing system to comply with governing regulation and specified insurance requirements.

C. Protect other work from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of the modified bituminous roofing system.

D. Coordinate installation of roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut-offs at end of each day’s work to cover exposed ply sheets and insulation with two (2) plies of #15 organic roofing felt set in full moppings of bitumen and with joints and edges sealed with roofing cement. Remove cut-offs immediately before resuming work.

E. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with the Equiviscous Temperature (EVT) Method as recommended by National Roofing Contractors Association (NRCA). Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5°F at point of application) more than one (1) hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either from information by manufacturer or by suitable test. Do not exceed recommended temperature limits during bitumen heating. Do not heat to a temperature higher than twenty five degrees (25°) below flash point. Discard bitumen that has been held at temperature exceeding Finishing Blowing Temperature (FBT) for more than three (3) hours. Keep kettle lid closed except when adding bitumen.
F. Bitumen Mopping Rate

1. Interply Mopping: Apply bitumen at the rate of approximately twenty five (25) lb. of bitumen per roof square.
2. Modified Membrane Mopping: Apply bitumen at the rate of approximately thirty (30) lb. of bitumen per roof square.

G. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

H. Apply roofing materials as specified by manufacturer's instructions.

1. Keep roofing materials dry before and during application.
2. Do not permit phased construction.
3. Complete application of roofing plies, modified sheet and flashing in a continuous operation.
4. Begin and apply only as much roofing in one day as can be completed that same day.

I. Cut-Offs (Waterstops): At end of each day’s roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of two (2) plies of #15 organic roofing felt set in full moppings of bitumen with joints and edges sealed.

3.05 BASE FIELD PLY INSTALLATION

A. Install one (1) ply sheet in twenty five (25) lbs. per square of bitumen shingled uniformly to achieve one (1) ply over the entire prepared substrate. Shingle in direction of slope of roof to shed water on each area of roof.

B. Lap ply sheet ends eight (8) inches. Stagger end laps twelve (12) inches minimum.

C. Lightly broom in fiberglass plies to assure complete adhesion.

D. Extend plies two (2) inches beyond top edges of cants at wall and roof projections and equipment bases.

E. Install base flashing ply to all perimeter and projection details.

3.06 MODIFIED MEMBRANE APPLICATION

A. Solidly bond the modified membrane to the base layers with specified asphalt at the rate of twenty five (25) to thirty (30) lbs. per 100 square feet.

B. The modified membrane roll must push a puddle of asphalt in front of it with asphalt slightly visible at all side laps. Exercise care during application to eliminate air entrapment under the membrane.
C. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.

D. Install subsequent rolls of modified membrane across the roof as above with a minimum of four (4) inch side laps and eight (8) inch end laps. Stagger the end laps. Apply the modified membrane in the same direction as the previous layers but stagger the laps so they do not coincide with the laps of the base layers.

E. Apply asphalt no more than five (5) feet ahead of each roll being embedded.

F. Extend membrane two (2) inches beyond top edge of all cants in full moppings of the specified asphalt.

3.07 FLASHING MEMBRANE INSTALLATION

A. Seal all curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.

B. Prepare all walls, penetrations and expansion joints to be flashed with asphalt primer at the rate of one hundred (100) square feet per gallon. Allow primer to dry tack free.

C. Use the modified membrane as the flashing membrane. Adhere to the underlying base flashing ply with specified asphalt unless otherwise noted in these specifications. Nail off at a minimum of eight (8) inches o.c. from the finished roof at all vertical surfaces.

D. Solidly adhere the entire sheet of flashing membrane to the substrate.

E. Seal all vertical laps of flashing membrane with a three-course application of trowel-grade mastic and fiberglass mesh.

F. Coordinate counter flashing, cap flashings, expansion joints, and similar work with modified bitumen roofing work.

G. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.

3.08 APPLICATION OF SURFACING

A. Pyramic White Acrylic Coating

1. Allow all cold applied mastics and coating to properly dry and cure before installing the white roof coating.

2. Paint all exposed roof membrane with manufacturer’s white, acrylic, fire resistant coating installed at a rate of one and a 1/2 gallons per square per coat. This shall be a two-coat application with the finished stroke in one direction for a total coverage of 3 gallons per 100 square feet.
3.09 CLEANING

A. Remove bitumen adhesive drippings from all walls, windows, floors, ladders and finished surfaces.

B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning instructions and conform to their instructions.

C. Repair or replace defaced or disfigured finishes caused by work of this section.

3.10 FINAL INSPECTION

A. At completion of roofing installation and associated work, meet with Contractor, installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.

B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.

C. The roofing system manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Contractor.

D. If core cuts verify the presence of damp or wet materials, the Contractor shall be required to replace the damaged areas at his own expense.

E. Repair or replace deteriorated or defective work found at time above inspection as required to produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

F. Notify the Owner and Architect upon completion of corrections.

G. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

3.11 DEMONSTRATION AND TRAINING

A. At a time and date agreed to by the Owner, instruct the Owner's facility manager, or other representative designated by the Owner, on the following procedures:
1. Troubleshooting procedures.
2. Notification procedures for reporting leaks or other problems.
4. The Owner's obligations for maintaining the warranty in effect and force.

5. The Manufacturer's obligations for maintaining the warranty in effect and force.

END OF SECTION
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SECTION 07 54 23

THERMOPLASTIC POLYOLEFIN ROOFING - CANOPIES

PART 1   GENERAL

1.01  WORK INCLUDED

   A. Provide a thermoplastic membrane roofing system on canopies. Work includes:

      1. Mechanically fastened, single ply polyester reinforced thermoplastic polyolefin (TPO) membrane.
      2. Cover board.
      3. Installing roof flashings and sheet metal furnished under Section 07 62 00.

   B. Modified bituminous membrane roofing for main building is included in Section 07 52 16.

1.02  RELATED SECTIONS

   A. Sustainable Design Requirements: Section 01 81 13.
   B. Wood Blocking: Section 06 10 50.
   D. Flashing and Sheet Metal: Sections 07 62 00.

1.03  QUALITY ASSURANCE

   A. Manufacturer Qualifications: To participate as a qualified company in production of Elasto/Plastic materials, the company must have a minimum of five (5) years as the sole manufacturer of the brand name. Manufacturer shall also furnish notarized certification that he has been in business and had roofs installed for a minimum of five (5) years.

   B. Installer Qualifications: An experienced roofing installer approved or licensed by roofing materials manufacturer and with not less than five (5) years of successful experience installing thermoplastic membrane roofing systems similar to those required for this project.

1.04  PERFORMANCE REQUIREMENTS

   A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
B. Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail Resistance: SH.

1.05 SUBMITTALS

A. Product Data: Submit for all items.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Include as a minimum the following:

1. Layout of roof showing sheet sizes and field joint locations.
2. Location and type of penetrations.
3. Perimeter, penetration and special details.
4. Description of all materials.
5. Conformance to fire classifications requirements of IBC 1505.
6. Layout of tapered insulation, including slopes.

C. Manufacturer's Approval: Obtain manufacturer's written approval of final shop drawings prior to beginning roofing operations.

D. Samples: Submit samples of all roofing and flashing materials.

E. Warranties: Sample of special warranties detailing terms as required herein.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged, labeled bundles or containers.

B. Store roofing materials and accessories at the site in storage trailers or the building in a dry, well-ventilated, weather tight place. Exterior storage not permitted. Comply with manufacturer's recommendations for handling and protection during installation.

1. Handle rolled goods to prevent damage to edge or ends.
2. Do not apply roofing materials to damp, frozen, dirty or dusty substrate surfaces.
C. Protection

1. Protect adjacent materials and surfaces from damage and soiling during roofing system installation.
2. Provide special protection or avoid heavy traffic on completed roofing work.
3. Protect paving and structure walls adjacent to hoists before starting work.
4. Do not overload the building structure with storage of materials or installation equipment on the substrate decking.
5. Handle and store materials and equipment to avoid damage to substrate decking.

1.07 PROJECT CONDITIONS

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

1.07 WARRANTY

A. Contractor and roofing subcontractor shall warrant the total roofing system (membrane, insulation and flashing) with respect to workmanship and proper application for two (2) years from the date of acceptance by the Owner. Should any leaks covered under the warranty occur during this period, corrective action will be taken by the Contractor to repair the roof to the satisfaction of the owner and membrane manufacturer. ALL CORRECTIVE WORK WILL BE DONE AT NO COST TO THE OWNER. Work includes all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, substrate boards, vapor retarders, roof pavers, and walkway products.

B. The manufacturer(s) of the materials used shall provide a written, No Dollar Limit, fifteen (15) year guarantee on the complete roof installation. Upon warranty inspection and acceptance of the roof, the guaranty will be turned over to the Owner on behalf of the Contractor, by an authorized representative of the manufacturer. The guaranty shall begin when the project is completed and accepted by the Owner. Submit final guaranty in triplicate.

1. Warranty includes membrane roofing, base flashings, fasteners, cover boards, roofing accessories and other components of membrane roofing system.
2. System shall be warranted for all requirements specified herein, including for wind uplift as required.

C. Corrective measures on leaks shall be undertaken within seventy-two (72) hours after notification has been received by the Contractor or membrane manufacturer from the Owner.
PART 2  PRODUCTS

2.01  MEMBRANE ROOFING

A.  Thermoplastic Polyolefin (TPO) Type

1.  Thermoplastic Sheet Membrane: Reinforced single ply membrane factory
    fabricated into flexible sheets.
    Thermoplastic Polyolefin Based Sheet.
3.  Thickness: Minimum 60 mils (0.60”).
4.  Physical Properties
   b.  Elongation at Break - ASTM D751: 30%.
   c.  Seam Strength - ASTM D751: 75 lbf.
   d.  Retention of Properties After Heat Aging - ASTM D3045
       2)  Elongation - ASTM D751: 25% of original.
   e.  Tearing Strength - D1004: 156 lbf.
   f.  Low Temperature Bend - D2136: Pass.
   g.  Accelerated Weathering Test (Xenon Arc) - D2565: 10,000 hrs.
       1)  Cracking (7x magnification): None.
       2)  Discoloration (By Observation): Negligible.
       3)  Crazing (7x magnification): None.
   h.  Linear Dimensional Change - ASTM D1204: 0.1%.

B.  Flashing: 60 mils (0.60”) nominal thick reinforced sheet factory fabricated to the
required shapes and sizes to suit project conditions; furnished by sheet roofing
membrane manufacturer.

1.  Inside and Outside Corners and Vent Flashing: Preformed.
2.  Provide asphalt compatible flashing membrane where asphalt
    contamination is anticipated.

C.  Adhesive: Provide types as recommended by manufacturer for materials and
    conditions encountered.

1.  Provide asphalt compatible flashing membrane where asphalt
    contamination is anticipated.

D.  Mechanical Fasteners: As recommended by roofing manufacturer.

E.  Splice Wash, Lap Sealant, Fastener Sealer, Etc.: Sheet material manufacturer's
    recommended materials for waterproof sealing of seams in membrane and
    waterproof sealing of joints between flashings and roofing membrane, adjoining
    surfaces, projections and penetrations through the roofing membrane. Compatible
    with materials with which used.
F. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. GEN FLEX ROOFING SYSTEMS
2. JOHNS MANVILLE
3. GAF
4. CARLISLE
5. FIRESTONE.
6. VERSICO.
7. MULE HIDE.

2.02 INSULATION

A. Provide adhesives and mechanical fasteners as recommended by insulation manufacturer for substrates encountered.

B. Coverboard: Provide one of the following:

1. ½” High Density Wood Fiberboard: ASTM C208 cellulosic-fiber insulating board, Type II, Grade 1. (adhered in hot asphalt)
2. ½” glass-mat, water-resistant gypsum substrate, primed surface; ASTM C1177, (adhered in adhesive). Dens-Deck by GEORGIA-PACIFIC, Secure Rock Roof Deck by USG, GlasRoc Roof Board by CERTAINTEED (adhered in adhesive)

2.03 FASTENERS

A. Provide roofing membrane manufacturer's recommended type mechanical fastener for deck. Type, size and spacing shall be as required to maintain manufacturer's 15 year system warranty and FM I-90.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation conditions. Do not proceed with insulation and roofing work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Verify that work which penetrates roof deck, or requires men or equipment to traverse roof deck, has been completed.

B. Examine substrate surfaces for adequate anchorage, foreign materials, moisture and unevenness that would prevent the execution of roofing system specified.
C. Correct unsatisfactory conditions before starting roofing. Roof deck surface conditions shall comply with manufacturer’s requirements and be acceptable to the roofing system installer.

D. Protect other work from spillage of roofing materials. Repair or replace other work damaged by installation of the thermoplastic membrane roofing system work.

3.03 SUBSTRATE BOARD

A. Install substrate board where indicated with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers’ written instructions.

3.04 ADHERED MEMBRANE INSTALLATION

A. Comply with roofing manufacturer's instructions and recommendations for handling and installing roofing system.

B. Install roof flashing and sheet metal work provided herein and furnished under Section 07 62 00.

3.05 CLEANING AND PROTECTION

A. Patch installations by other trades and make all necessary repairs as required.

B. Upon completion of roofing work, clean gutters and drains of foreign materials and aggregate and remove all debris and surplus materials.

C. Protect finished roof areas from foot traffic and construction damage until Contract Completion.

END OF SECTION
SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1  GENERAL

1.01  WORK INCLUDED

A. Provide flashing and sheet metal work as shown and specified. Work includes:

1. Copings.
2. Flashing and counterflashing.
3. Miscellaneous rooftop concealed flashing.
4. Fasteners, sealants, solder and accessories to complete the work.

1.02  QUALITY ASSURANCE

A. Comply with Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) "Architectural Sheet Metal Manual" recommendations for fabrication and installation of the work.

B. Reference Standards

2. American Architectural Manufacturers Association (AAMA)

C. Subcontractor: Subcontract sheet metal associated with roofing as a part of the roofing contract for undivided responsibility.

D. Attachments to or penetrations in roofing systems to be made only with full approval of roofing manufacturer. Obtain approvals as required for installation of work under this section. Notify Architect if deviations from documents is required to obtain approval from roofing manufacturer prior to fabrication.

E. Painted Finishes: Factory painted finish to be performed by an applicator specifically approved by the paint manufacturer. The applicator shall provide written notification of approval by paint manufacturer prior to application of the finish.

B. Performance Requirements
1. Texas State Board of Insurance Windstorm Regulations.

1.03 SUBMITTALS

A. Shop Drawings and Product Data: Submit on all sheet metal work specified herein. Drawings to show all expansion joint details, joint details, waterproof connections to adjoining work and at obstructions and penetrations, methods of attaching to building and all formed sections.

B. Submit 8" square material samples for each type of sheet metal required.

C. Submit full width by 8" long samples of all manufactured and fabricated items. Provide with specified finish and color.

1.04 PROJECT CONDITIONS

A. Do not proceed with the installation of flashing and sheet metal work until substrate construction, blocking and other construction to receive the work are completed.

1.05 WARRANTY

A. Contractor's warranty required for roofing system work shall include all related roof flashing and sheet metal work. Refer to Section 07 52 16.

B. Provide Contractor's guarantee for all sheet metal work under this Section to be free from defects of material and workmanship for a period of two (2) years. Work that is not water tight or is damaged by winds that do not exceed 90 mph will be considered defective.

C. Provide manufacturer's guarantee of paint finish against failure of paint finish. Failure includes blistering, peeling, cracking, flaking, checking, excessive color change and chalking. Color change shall not exceed 5 N.B.S. units (per ASTM D523) and chalking shall not less than a rating of 8 per ASTM D4214.

1. Warranty Period: 20 years.

PART 2 PRODUCTS

2.01 MATERIALS

A. Prefinished Aluminum Sheet - All Flashings Exposed to View

1. Description: 3004 alloy aluminum sheet with factory applied finish.

2. Finish
   a. Exposed Surfaces
      1) Material/Manufacturer: Fluoropolymer baked enamel finish with Kynar 500 (70%) resins by ELF ATOCHEM OF NORTH AMERICA INC.; "Trinar" by AKZO; "Duranar" by PPG; "Fluropon" by VALSPAR or equal. Total dry film thickness not less than 1.0 mils

3) Color: As selected by Architect from paint manufacturer’s complete specified line.

4) Application: Apply coating systems in strict accordance with manufacturer’s printed instructions and recommendations. Refer to Quality Assurance in Part 1.

b. Concealed Surfaces: Can be manufacturer's standard coating for concealed surfaces.

3. Thicknesses: Provide the following minimum thicknesses:

a. Coping: .063”.

b. Miscellaneous Flashing (not otherwise identified): .032”.

B. Miscellaneous Flashing - Not Exposed to View: Galvanized steel, ASTM A653 G60. Mill phosphatized for paint adhesion. 0.033” minimum unless otherwise indicated.

C. Fasteners: Provide same metal as sheet metal or other non-corrosive compatible metal recommended by sheet metal manufacturer.

D. Roof Expansion Joint: Chlorinated polyethylene bellows with stainless steel flanges. AFCO Flexi-span LBH; WASCO/YORK Superflash Roof Expansion Joint; JOHNS MANVILLE Expando Flash.

E. Bituminous coating: Acid and alkali resistant solvent type black bituminous mastic.

F. Joint Sealants: See Section 07 92 00. Color matched to factory finished materials at coping and similar type systems.

G. Metal accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work; matching or compatible with material installed, non-corrosive, size and gage as required for performance.

H. Underlayment

1. Membrane: Bituthene Ice and Water Shield by W. R. GRACE; Polyken 640 Underlayment Membrane by POLYKEN TECHNOLOGIES; Polyguard Deck Guard by POLYGUARD PRODUCTS; Weather Watch by GAF; Winterguard by CERTAINTEED, a modified bituminous membrane, minimum 40 mils thick, self-adhering, self-sealing moisture barrier.


I. Wood members: Comply with requirements of Wood Blocking, Section 06 10 50.

2.03 FABRICATION

A. Shop fabricate sheet metal work to comply with standard industry standards as shown by SMACNA in the "Architectural Sheet Metal Manual."
B. Form sections square, true and accurate to size and profile, free from distortion and other defects detrimental to appearance or performance.

1. Make all lines, edges, angles and moldings straight, sharp and true; reinforce for rigidity and strength.

C. Fabricate for watertight and weatherproof performance with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form exposed sheet metal work with exposed edges folded back to form hems.

1. Fabricate with seams overlapping in the direction of water flow.

D. Fabricate non-moving seams in sheet metal with flat lock or butt hairline joints except as otherwise indicated. Fabricate corners mitered, soldered and sealed as one piece. Locate corner joints 2'-0" from corners and intersections.

E. Seal movable non-expansion type joints with joint sealant. Form joints as indicated, when not indicated, in compliance with industry standards to receive joint sealants.

F. Provide for separation of metal from non-compatible or corrosive substrates by coating concealed surfaces with bituminous coating or other permanent separation as recommended by the sheet metal manufacturer.

G. Coping - Shop formed: SMACNA Page 3.9 (Figure 3-4) and 3.13 (Figure 3-6), as applicable with continuous cleats both sides and concealed fasteners. Slope to drain towards roof. Corners to be mitered and soldered or welded.

1. Seams: SMACNA table 3-1 on Page 3.4. Butt joint and backup plate type, 12" wide centered on joint.
2. Cleats: 0.050" stainless steel.

**PART 3 EXECUTION**

3.01 PREPARATION

A. Examine substrates and installation conditions. Do not install flashing and sheet metal work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

C. Coordinate flashing and sheet metal work with other work for the correct sequencing of items which make up the entire membrane or system of weatherproofing and rain drainage.
3.02  INSTALLATION

A. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations, and drawing details for installation of the work.

B. Install prefabricated items in accordance with manufacturer's instructions and recommendations.

C. Anchor units securely in place by methods indicated, providing for thermal expansion. Conceal fasteners and expansion provisions whenever possible. Install joint sealants where indicated.

D. Set units true to lines and levels indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

E. Separate sheet metal work from dissimilar metals, treated wood, and cementitious materials. Provide roofing felt underlayment and rosin-sized paper slip sheet over treated wood surfaces.

F. Fabricate, support and anchor downspouts in a manner which will withstand thermal expansion, stresses and full loading by ice or water without damage, deterioration or leakage.

G. Coping

   1. Install membrane roofing flashing over top of parapet substrate prior to installing coping. See Section 07 52 16. Coordinate installation.
   2. Apply continuous bead of sealant on both sides of joints immediately prior to setting coverplates.

END OF SECTION
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SECTION 07 84 00

FIRESTOPPING

PART 1    GENERAL

1.01 WORK INCLUDED

A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and/or hot gases through penetrations, blank openings, construction joints, or at perimeter fire containment in or adjacent to fire-rated barriers in accordance with the requirements of the Building Code for this project.

B. Firestop systems shall be used in locations including, but not limited to, the following:

1. Penetrations through fire resistance rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
2. Penetrations through fire resistance rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
4. Sealant joints in fire resistance rated construction.
   a. Gaps between the top of walls and ceilings, floor or roof assemblies. Includes filling metal deck flutes where applicable.
   b. Openings around structural members which penetrate floors or walls.
   c. Control joints.
   d. Floor joints not requiring expansion joints.
5. Walls enclosing plenum spaces, rated and unrated.
   a. Gaps between the top of walls and ceilings or roof assemblies.
   b. Openings around items which penetrate walls.
6. Perimeter slab/wall, slab/curtainwall and similar perimeter applications.
7. Other locations indicated.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. Gypsum Wallboard Partitions: Section 09 21 16.

C. Deflection tracks for metal stud fire walls: Section 09 21 16.
1.03 **DEFINITIONS**

A. Firestopping: Material or combination of materials (assembly) to retain integrity of fire rated construction by maintaining an effective barrier against the spread of flame, smoke, and gases.

B. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.

C. Through-Penetration Firestop Systems: Material or combination of materials which are field constructed of fill, void, or cavity materials and forming materials, designed to resist fire spread when installed as a complete firestop system.

D. Through-Penetration Firestop Devices: Factory built products designed to resist fire spread. Complete when delivered to site; ready for installation.

E. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or flow construction type and a specific penetrant(s).

F. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.

G. Membrane-penetration: Any penetration in a fire-rated wall that breaches only one side of the barrier.

H. Fire Resistive Joint: Any gap, joint, or opening, whether static or dynamic, between two fire rated barriers including where the top of a wall meets a floor; wall edge to wall edge applications; floor edge to floor edge configurations; floor edge to wall.

I. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire rated floor assembly and a non-rated exterior wall assembly.

1.04 **REFERENCES**

A. American Society for Testing and Materials (ASTM)

4. E2174: Standard Practice for On-Site Inspection of Installed Fire Stops

B. National Fire Protection Association (NFPA)

1. 70: National Electrical Code (NEC)
C. Underwriters’ Laboratories (UL)
   1. UL1479: Fire Tests of Through Penetration Fire Stops.
   2. UL2079: Tests for Fire Resistance of Building Joint Systems

D. Firestop Design Classification References
   1. Warnock Hersey Listing Manual
   2. UL Fire Resistance Directory - Vol. 1

E. Factory Mutual (FM) Research
   1. FM Approval Standard of Firestop Contractors – Class 4991

1.05 SYSTEM PERFORMANCE REQUIREMENTS

A. System Design and Product Selection: Contractor responsible for selection of products and tested designs that fulfill the firestopping requirements of this section.

B. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gasses.

C. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated as determined per ASTM E814, UL 1479 but not less than that equaling or exceeding the fire resistance rating of the constructions penetrated.

D. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where specified by codes or where the following conditions exist:
   1. Where firestop systems protect penetrations located outside of wall cavities.
   2. Where firestop systems protect penetrations located outside fire resistive shaft enclosures.
   3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature rise rating.
   4. Where firestop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 square inch in overall cross sectional area.

E. L-Rated Through-Penetration Firestop Systems: Provide firestop systems with L ratings, in addition to F and T ratings, as determined per UL 1479, where indicated by Code.
F. Fire Resistive Joint Sealants: Provide joint sealants with fire resistance ratings indicated, as determined per ASTM E119, UL 1479 and UL 2079 but not less than that equaling or exceeding the fire resistance rating of the construction in which the joint occurs.

G. For firestopping exposed to traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions and will meet load requirements.

1. For piping penetrations for plumbing and wet pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not required removal of insulation.

H. For through-penetration firestop systems exposed to view, provide products with flame spread of less than 25 and smoke developed ratings of less than 450, as determined per ASTM E 84.

I. Where there is no specific third party tested and classified firestop system available for an installed condition, obtain from the firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to the Approving Authority and Authority Having Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council (IFC) guidelines.

1.06 SUBMITTALS

A. Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL or other nationally recognized independent testing laboratories firestop systems to be used, and manufacturer's installation instructions.

1. Manufacturer's engineering judgement identification number and drawing details when no tested system is available.

B. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
2. Where project conditions require modification of qualified testing and inspecting agency’s illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer with modifications marked.

C. Product certificates signed by manufacturers of firestopping products certifying that their products and installation comply with specified requirements. Certification shall be signed by the Installer.

D. Certification is required from manufacturer that Installer has been trained in the handling and installation of their products.

E. Firestopping installer shall provide a letter of certification stating that all firestopping systems have been installed in accordance with the Contract Documents.

F. Special Environmental Requirements: Submit the following in accordance with Section 01 81 13:

1. Product Data: For Sealant and Mastics, documentation indicating VOC Content

1.07 QUALITY ASSURANCE

A. Meet requirements of ASTM E814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated and other ASTM Standards as applicable for the installation.


B. Requirements of Regulatory Agencies: Comply with the applicable requirements for fire separations and penetrations of the following:

1. IBC: See Chapter 6, Table 601 and 602 for the time rated construction requirements.
2. NFPA 70.

C. Installer: Specialist in the installation of type(s) of firestopping required; trained and approved by the firestop manufacturer.

1. Shown to have successfully completed not less than 5 firestop projects similar in type and size to that of this Project.

D. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy".
E. Do not use any product containing solvents that require hazardous waste disposal or which after curing dissolve in water.

F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

G. Single Source Responsibility: Obtain firestop systems for each kind of penetration and construction condition indicated from a single primary firestop systems manufacturer.

1. Materials of different manufacture than allowed by the tested and listed system shall not be intermixed in the same firestop system or opening.
2. Tested and listed firestop systems are to be used before an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) is installed.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping undamaged products to project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacturer; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.

1. Comply with recommended procedures, precautions, or remedies described in material safety data sheets as applicable.

B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. Do not use damaged or expired materials.

1.09 PROJECT CONDITIONS

A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate this Work as required with work of other trades. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
B. Do not cover up those firestopping installations that will become concealed behind other construction until Owner's inspection agency and authorities having jurisdiction, if required, have examined each installation.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

A. Provide products from one or more of the following manufacturers according to the suitability of the product for the intended purpose.

1. W.R. GRACE (Flamesafe System)
2. FYRESLEEVE INDUSTRIES
3. TREMCO
4. HILTI, INC.
5. SPECIFIED TECHNOLOGIES (STI).
6. 3M FIRE PROTECTION PRODUCTS.
7. THE RECTORSEAL CORPORATION (Metacaulk and Bio Fireshield).
8. NELSON FIRESTOP PRODUCTS.

2.02 MATERIALS - GENERAL

A. As selected by Contractor. See SYSTEM PERFORMANCE REQUIREMENTS in Part 1 hereinbefore.

B. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

1. All materials shall comply with ASTM E814 or E 119 (UL 1429), and shall be manufactured of nontoxic, non-hazardous, asbestos free materials, and unaffected by water or moisture when cured.
2. Primers: Conform to manufacturer's recommendations for primers required for various substrates and conditions.
3. Backup Materials: Backup materials, supports, and anchoring devices shall be provided as required by UL testing.
4. Provide all firestopping sealant materials within the VOC limits specified in Section 01 81 13.

C. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials must be noncombustible and may include the following:
1. Semi-refractory fiber (mineral wool) insulation.
2. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
3. Joint fillers for joint sealants.

2. Temporary forming materials.
5. Steel sleeves.

2.03  RATED STUD DEFLECTION ASSEMBLY

A. Deflection Track Ceiling Runner: See Section 09 21 16.
B. Gypsum Wallboard: See Section 09 21 16.
C. Insulation: Mineral wool, 3.5 PCF minimum density.
D. Firestopping Compound: Types as manufactured by listed manufacturers in 2.01A herein.
E. Accessories: Provide all fasteners, clips and other related installation accessories as required for a complete UL approved assembly.

2.04  MIXING

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

PART 3  EXECUTION

3.01  EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

3.02  PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

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

3. Remove laitance and form release agents from concrete.

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

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop systems seal with substances.

3.03 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. General: Comply with the "System Performance Requirements" in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

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

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

3.04 INSTALLING FIRE RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" in Part 1 with ASTM C1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
B. Install joint fillers to provide support of sealants during application and at position required to produce the cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.05 INSTALLING PERIMETER FIRE BARRIER SYSTEMS

A. General: Comply with “System Performance Requirements” article in Part 1 and with the firestop manufacture’s installation and drawings pertaining to products and applications indicated.

B. Install metal framing, curtain wall insulation, mechanical attachments, safing materials and firestop materials as applicable within the system design.

3.06 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage".
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.

3.07 FIELD QUALITY CONTROL

A. The inspector shall advise the contractor of any deficiencies noted.

B. Do not proceed to enclose firestopping with other construction until inspection agency has verified that the firestop installation complies with the requirements.
C. Where deficiencies are found, repair or replace the firestopping so that it complies with requirements of tested and listed system design.

3.06 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

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

END OF SECTION
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SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.01 SCOPE

A. General: Prepare joints and apply sealant at all locations which normally require sealing to prevent infiltration of air, water, and insects and to reduce transmission of sound.

B. Apply sealants to exterior and interior non-static joints. Do not seal normal drainage points or weep holes. Include the following:

1. tilt-up panel expansion joints
2. around louvers, exterior trim, windows, door frames, aluminum entrances and other penetrations or openings in exterior walls
3. exterior insulation and finish system control joints
4. threshold bedding
5. joints between different wall materials
6. termination joints between wall materials and adjacent materials
7. perimeter seal of metal door and borrowed light frames where they abut masonry and where they abut drywall in shower rooms, toilet rooms and kitchens
8. composite wall panel joints
9. other applications indicated

C. Sealing of joints in concrete construction, including sidewalk joints, concrete paving joints and floor joints, tile floor expansion joints and other floor joints as indicated.

D. Sealing of all exterior and interior locations where materials or equipment do not fit together or against the adjoining surface with a hairline joint.

E. Caulking of interior static joints. Include the following:

1. intersection of exposed structure or ceiling construction with masonry walls
2. perimeter seal of metal door and borrowed light frames where they abut drywall, except in shower rooms, toilet rooms and kitchens
3. intersection of grilles and louvers with adjacent surfaces
4. intersection of cabinets, casework and similar items applied to or recessed in walls
5. other applications indicated

F. Sealing between wall and wall mounted plumbing fixtures and floor and floor mounted plumbing fixtures.
G. Sealing at intersection of plastic laminate tops and side/backsplashes to each other and to wall.

H. Sealing at reglets and flashings set in sealant.

I. Joints, perimeter, and penetrations in sound-rated assemblies. See Section 09 21 16.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

1.03 GENERAL PERFORMANCE

A. Except as otherwise indicated, joint sealant is required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application.

B. Failures of installed sealant to comply with this requirement will be recognized as failures of both materials and workmanship.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

1. Certification, in the form of manufacturer's standard data sheet or by letter, stating that each type of compound and sealant to be furnished complies with these specifications.

2. Statement that each product to be furnished is recommended for the application shown and is compatible with all materials to which applied.

3. Instructions for handling, storage, mixing, priming, installation, curing and protection for each type of sealant.

B. Submit manufacturer's color chart for color selections.

C. Submit cured sealant samples in colors required for the work. Architect's approval will be for color only. Compliance with other requirements is the Contractor's responsibility.

D. Stone and sealant test reports for each type of stone used.

E. Special Environmental Requirements: Submit the following in accordance with Section 01 81 13:

1. Product Data: For Sealant and Adhesives, documentation indicating VOC Content
1.05 STORAGE AND HANDLING

A. Prevent inclusion of foreign matter or the damage of materials by water or breakage.

B. Procure and store in original containers until ready for use.

C. Materials showing evidence of damage shall be rejected.

1.06 WARRANTY

A. Installer's Warranty: Contractor and joint sealant applicator shall jointly warranty joint sealant work for two (2) years from date of final acceptance. Warranty shall include replacing joints which fail to perform as airtight; or fail in adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration and stain resistance, general durability or any other form of apparent deterioration (excluding inherent qualities and limitations clearly specified in the manufacturer's submitted product data).

B. 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 for ten (10) years from date of final acceptance.

C. 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.

C. Comply with these specifications for repair or replacement of work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Definition: The term "sealant" will be understood to be an elastomeric type. The term "caulk" will be understood to be a synthetic resin base of highest quality acrylic latex compound.

B. General
1. 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.

2. 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):
   a. Architectural Sealants: 250 g/L.
   b. Sealant Primers for Nonporous Substrates: 250 g/L.
   c. Sealant Primers for Porous Substrates: 775 g/L.

3. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

4. Colors: As selected by Architect from manufacturer's full range; selected colors to match adjacent materials.

5. Where exposed to foot traffic, select materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealant system.

C. Manufacturers: BOSTIK; DOW CORNING CORPORATION; EUCLID CHEMICAL; TREMCO MANUFACTURING COMPANY; GENERAL ELECTRIC COMPANY/MOMENTIVE; SIKA CHEMICAL CO.; MAMECO INTERNATIONAL; BASF BUILDING SYSTEMS; VULCHEM.

   1. Manufacturer's listed under the following applications are for basis of design. Equal products by above listed manufacturers are acceptable.

D. Exterior Vertical and Overhead Joints: Single-component neutral curing silicone sealant meeting ASTM C920, Type S, Grade NS, Class 50.

   1. DOW 791
   2. GE SCS9000 Silpruf NB
   3. TREMCO Spectrum 2
   4. PECORA 895 NST

E. Horizontal Wearing Expansion Joints; Interior and Exterior

   1. Type: Two-part polyurethane based elastomeric sealant, complying with ASTM C920, Class 25, Type M, Grade P. Self-leveling or gun grade type as recommended by manufacturer for application shown.
   2. Location: For joints in exterior concrete pavements, sidewalks and interior floors.
      a. BOSTIK Chem-Calk 555-SL
      b. EUCLID Euclastic II
      c. SONNEBORN Sonolastic SL 2
      d. TREMCO THC 900/901

F. Interior Vertical and Overhead Joints: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for
G. Sealants at Countertops, Backsplashes and Plumbing Fixtures: ASTM C920, Type S, Grade NS, Class 25. Provide with mildew resistive additive.

1. Sealant Colors
   a. Countertops and Backsplashes: Clear.
   b. Plumbing Fixtures: white, unless colored fixtures are selected, then sealant color shall match fixture color.

2. Manufacturers/Products
   a. DOW 786
   b. GE SCS1700 Sanitary.
   c. SONNEBORN Sonolastic Omniplus
   d. TREMCO Tremsil 600
   e. PECORA 898 Sanitary Sealant

H. Caulk Joints – Interior, Static - Paintable: High quality acrylic latex compound, non-staining non-bleeding complying with ASTM C834, as supplied by one of the above listed manufacturers.

2.02 ACCESSORIES

A. Joint Primer/Sealer: Non-staining type, recommended by sealant manufacturer; compatible with joint forming material.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming material.

C. Bond Breaker Tape: Pressure sensitive polyethylene or plastic tape, recommended by sealant manufacturer, to suit applications where bond to substrate should be avoided for proper joint sealant performance.

D. Joint Backing: Compressible rod stock conforming to ASTM C1330, Type B; material as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

E. Solvents: Cleaning agent recommended by the manufacturer of the sealant in writing to Architect.

F. Expanding Control Joint Filler
   1. Description: Precompressed, closed-cell, self-expanding foam. Self stick pressure sensitive adhesive (PSA) on one or two sides as required by substrate conditions.
2. Size: As required for specific joint width and thickness.
3. Manufacturer: EMSEAL, WILLIAMS PRODUCTS, ILLBRUCK, SCHUL INTERNATIONAL or POLYTITE MANUFACTURING CORP.

**PART 3 EXECUTION**

3.01 INSPECTION

A. Examine substrates and installation conditions. Do not proceed with joint sealant work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Clean, seal and prime surfaces in accordance with manufacturer's recommendations. Confine primer/sealant to areas of sealant bond.

B. Remove dust, dirt, loose coatings, moisture and other substances which could interfere with sealant bond.

C. Remove lacquers and protective films from metal surfaces.

3.03 INSTALLATION

A. Apply joint sealant as late as possible in construction, preceding painting and following cleaning operations. Do not apply sealant during inclement weather conditions or when temperature is above or below manufacturer's limitations for installation.

B. Install joint sealant materials and accessories in strict accordance with manufacturer's installation instructions.

C. Set joint filler units at depth or position in joint as indicated to coordinate with other work. Do not leave voids or gaps between ends of joint filler units.

D. Install sealant backer rod, except where recommended to be omitted by sealant manufacturer for application indicated. Use rod diameter that will cause compression when installed.

E. Install bond breaker tape and where required by manufacturer's recommendations to ensure that sealants will perform as intended.

F. Apply joint sealants in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces on both sides. Fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. At horizontal joints between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt. Hand tool and finish all joints.
G. Install joint sealants within recommended temperature ranges and to depths indicated or when not indicated, as recommended by sealant manufacturer. For normal moving vertical and horizontal joints, fill joints to a depth equal to 50% of joint width, but not more than 1/2" deep nor less than 1/4" deep, measured at the center section of bead.

H. Confine materials to joint areas with masking tapes or other acceptable methods. Remove excess sealant materials promptly as work progresses and clean adjoining surfaces.

3.04 CLEANING

A. Upon completion, remove and dispose of masking materials; remove all excess sealing materials; clean adjacent materials of all soil and stain resulting from sealing operations.

1. Replace damaged material and material which cannot be properly cleaned.

END OF SECTION
SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY
A. Section includes:
   1. Standard steel doors and frames.
   2. Fire rated steel doors and frames.

1.02 RELATED SECTIONS
A. Sustainable Design Requirements: Section 01 81 13.
B. Door Hardware: Section 08 71 00.

1.03 QUALITY ASSURANCE
A. Provide metal doors and frames fabricated by one manufacturer to ensure uniformity in appearance and construction.
B. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.
   3. SDI: Steel Door Institute.
   4. DHI: Door and Hardware Institute.
C. Fire rated doors and frames: Provide units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E152, and are labeled and tested by Factory Mutual (FM), Underwriters Laboratories (UL), or other National Recognized testing agency. Units shall bear testing agency labels.
   1. Provide UL labels permanently fastened on each door and frame which is within the size limitations established by NFPA and UL for labeling.
   2. Provide anchors for UL labeled frames required by the authority having jurisdiction.

1.04 SUBMITTALS
A. Submit manufacturer's product data and installation instructions for each type of standard metal door and frame required.
B. Submit shop drawings. Identify doors and frames in accordance with drawing door schedule. Indicate:

1. Elevations of each door design.
2. Hardware locations, installation methods and hardware reinforcements.
3. Dimensions and shapes of materials, anchorage and fastening methods.
4. Door frame types, profile of molding and details.
5. Wall opening construction and connection to other work.

C. Certificates documenting:

1. Fire testing: Fire-rated units have been successfully tested in accordance with Paragraph 1.03C.

D. Submit for LEED Credit documentation.

1. Refer to Section 01 81 13 “Sustainable Design Requirements” for additional LEED submittal requirements.
2. Product Data for Credit MRC4: For products having recycled content, provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating material costs for each product having recycled content.
3. Product data for Credit MRC5: For products having regional content:
   a. Provide documentation indicating location of manufacturer of product. If only a fraction of the material is manufactured regionally, indicate fraction as a percentage product’s total weight.
   b. Provide documentation indicating location of extraction, harvest or recovery of raw material in product. If only a fraction of the material is extracted, harvested or recovered regionally, indicated fraction as a percentage of product’s total weight.
   c. Include statement indicating material costs for each product having regional content.
4. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building’s weatherproofing system.
5. Product Data for Credit EQ4.2: Provide documentation indicating VOC content of product for all paints, primers and coatings applied on-site and interior of the building’s weatherproofing system.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver metal doors and frames cartoned or crated for protection during transit and job delivery. Provide sealed wrapping for factory.

B. Store doors and frames inside the building in a dry, well-ventilated area. Protect from damage, wetting and deterioration in accordance with manufacturer’s recommendations.
PART 2  PRODUCTS

2.01  ACCEPTABLE MANUFACTURERS

A.  Manufacturer: STEELCRAFT MFG. CO; CECO CORP.; PIONEER INDUSTRIES; REPUBLIC BUILDERS PRODUCTS CORP.; CURRIES; BLACK MOUNTAIN DOOR.

2.02  MATERIALS AND COMPONENTS

A. Materials

1. Metallic-Coated Steel: Commercial quality, hot dipped, A-60 galvannealed steel in accordance with ASTM A653, “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”.

2. Cold-Rolled Steel: Commercial Steel in accordance with ASTM A1008, “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy and High Strength with Improved Formability”; Type B; suitable for exposed applications.

3. Hot-Rolled Steel Sheet: Commercial Steel in accordance with ASTM A1011, “Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength”; Type B; free of scale, pitting, or surface defects; pickled and oiled.

4. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B  Comply with SDI 100 material and fabrication recommendations and as specified.

C. Standard Metal Doors

1. Provide flush seamless type doors with seamless faces and edges, 1-3/4” thick, internally reinforced. Top and bottom closed flush.
   a. Provide glass lites where indicated.

2. Exterior Doors: Provide doors complying with requirements of ANSI 250.8 for Level 3 (extra heavy duty) and Model 1 (full flush design) and ANSI A250.4 for physical endurance Level A.
   a. Fabricated from metallic-coated (galvanized) steel face sheets, mill phosphatized; minimum .0635” thickness (16 gage).
   b. Core: Minimum 1-1/2 lb. density polyurethane or polyisocyanurate; thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
   c. Tops and bottoms closed with flush galvanized steel caps.

3. Interior Doors: Provide doors complying with requirements of ANSI 250.8 for Level 2 (heavy duty) and Model 1 (full flush design) and ANSI A250.4 for physical endurance Level A
   a. Fabricated from cold rolled steel; stretcher-leveled standard flatness; minimum uncoated .042” thickness.
b. Kraft resin impregnated honeycomb or polystyrene slab core bonded to door face sheets with thermal adhesive.

4. Hardware Reinforcements: Meet or exceed ANSI/SDI A250.6 requirements.
5. Edge Profile: 1/8” bevel in 2” core on hinge and lock edges.
6. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings. Factory prepare for hardware as scheduled in Section 08 71 10. Mount astragal to overlap on key side of doors.
7. Louvers: Inserted fixed type, minimum free area of 38%.

D. Standard Metal Frames

1. Interior Frames: Fabricated from either commercial grade cold-rolled steel conforming to ASTM A1008 or commercial grade hot-rolled and pickled steel conforming to ASTM A1011, minimum uncoated 0.053” thickness. Set-up and welded type, all miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
   a. Back prime frames with asphaltic emulsion.
2. Exterior Frames: Fabricated from commercial grade metallic–coated (galvanized) steel conforming to ASTM A653, minimum uncoated 0.053” thickness (14 gage), and shall have an A-60 zinc coating (0.30 ounces per square foot per side). Set-up and welded type, all miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
   a. Provide ¾” stops for sidelites and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8” stops.
3. Profile: Double rabbet, jamb face and depth as indicated.
4. Hardware Reinforcements: Meet SDI 107 requirements.
5. Transoms and Sidelites: Provide for loose glazing stops to be secured with countersunk screws.
   a. Provide ⅞” stops for sidelites and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8” stops.

E. Fire Doors and Frames

1. Comply with Fire-Rated Door Requirements specified herein before (Paragraph 1.03C).
3. Classification: As indicated.
4. Conform to requirements of Standard Metal Door and Frames specified herein.

F. Frames for Glazed Openings (Borrowed Light): Minimum uncoated 0.053” with integral stop, profile and size per drawings. Provide loose metal glazing stops of same gage as frame.

1. Provide for loose stops to be secured with countersunk screws.
   a. Provide ¾” stops for sidelites and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8” stops.
2. Verify thickness of glazing material before fabrication and glazing clearances required.
3. Frame components to be fully welded, except required loose glazing stops, at connections with exposed welds ground flush and smooth with frame surfaces.

4. Fire Rated Frames: Provide for ratings indicated in accordance with paragraph 2.02D herein.

2.03 FABRICATION

A. Reinforce and prepare doors and frames to receive hardware. Fit for hardware at the factory to template. Do all necessary cutting, drilling and tapping. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.

B. Provide surfaces smooth and free from defects, warp or buckle with arrises straight and sharp.

C. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface applied finish hardware may be done at project site.

D. Locate finish hardware as shown on drawings or, if not shown, in accordance with DHI "Recommended Locations for Builder's Hardware."

E. Door and Frame Fabrication

1. Provide cutouts for mortised hardware, accurately located and made to fit hardware.
2. Punch frames for door silencers, three on strike side for single doors. Factory install plastic caps. Stick-on silencers are not acceptable.
3. Exterior and Interior Frames: Provide minimum three anchors of suitable design for each jamb. Provide galvanized anchors for units built into exterior walls.
4. Floor Anchors: Provide floor clip on bottom of each jamb. Provide angle spreaders at bottom of each set-up frame.

F. Shop Painting

1. Clean, bonderize or chemically treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
2. Clean steel surfaces of mill scale, rust oil, grease, dirt and other foreign materials before application of paint. Sand free of imperfections.
3. Apply one baked-on shop coat of rust-inhibitive prime paint in accordance with ASNI A224.1. Provide a smooth, uniformly finished surface ready to receive finish paint.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, rough openings and installation conditions.
Do not proceed with metal door and frame work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install metal doors and frames in accordance with manufacturer's instructions and recommendations.

B. Placing Frames

1. General
   a. Comply with ANSI/SDI A250.11 (SDI 105) "Recommended Erection Instructions for Steel Frames."
   b. Erect frames in proper position to receive partition work before construction of enclosing walls. Set frames accurately in position, plumbed, aligned with heads level and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders.
   c. Grout frames as indicated on the drawings. Coordinate grout placement with adjoining materials and door hardware.

2. At Masonry Construction: Locate wall anchors at 16" on center. Building-in of anchors and grouting of frames is specified in Section 04 00 00.

3. Fire-Rated Frames: In accordance with NFPA standard No. 80 and SDI 118.

4. Metal Stud Partitions: Install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws.

C. Door Installation

1. Install doors plumb and in true alignment in prepared openings. Fit metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8 (SDI100).

2. Install fire-rated doors with clearances as specified in NFPA Standard No. 80 and SDI 118.

D. Immediately after erection, sand smooth rusted or damaged areas of door and frame coat and apply touch-up prime coat of compatible air-drying primer.

3.03 FIELD QUALITY CONTROL

A. Final Adjustment: Provide final adjustment as follows:

1. Door Contact with Silencers: Doors shall strike a minimum of two (2) silencers without binding lock or latch bolts in strike plate.

2. Head, Strike and Hinge Jamb Clearance: 1/8".
3. Meeting Edge Clearance, Pairs of Doors: +1/16”
4. Bolts and Screws: Leave tight and firmly seated.

END OF SECTION
PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following types of wood doors:

1. Solid core
2. Fire rated

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.
B. Hollow Metal Door Frames: Section 08 11 13.
C. Interior Aluminum Storefront Frames: Section 08 43 14.
D. Door Hardware Section 08 71 10.

1.03 QUALITY ASSURANCE

A. Provide wood doors fabricated by one manufacturer to ensure uniformity in appearance and construction.

B. Reference Standards

1. Underwriters' Laboratories - UL 10C (positive pressure) - Fire Tests of Door Assemblies
2. Window and Door Manufacturers Association (WDMA): WDMA IS 1A-04.
4. NFPA 80 - Fire Doors and Windows
5. NFPA 252 - Standard Methods of Fire Tests for Door Assemblies

C. Sustainably Harvested Wood: Certification Organizations shall be accredited by the Forest Stewardship Council.

D. Engineered Wood Products

1. Determine formaldehyde concentrations in air from wood products under test conditions of temperature and relative humidity in accordance with ASTM D6007 or E1333.
2. Determine Volatile Organic Compounds (VOC), excluding formaldehyde, emitted from manufactured wood-based panels in accordance with ASTM D6330.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of wood door required.
   1. Include details of core and edge construction.
   2. Include certification indicating compliance with specification requirements.

B. Submit for LEED Credit documentation.
   1. Refer to Section 01 8113 “Sustainable Design Requirements” for additional LEED submittal requirements.
   2. Product Data for Credit MRc4: For products having recycled content, provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating material costs for each product having recycled content.
   3. Product Data for Credit MRc7: FSC Certified Wood, submit chain-of-custody certificates
   4. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building’s weatherproofing system.
   5. Product Data for Credit EQ4.2: Provide documentation indicating VOC content of product for all paints, primers and coatings applied on-site and interior of the building’s weatherproofing system.
   6. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde

C. Submit Shop Drawings
   1. Indicate location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking and other pertinent data.
   2. Identify doors in accordance with drawing door schedule.

D. Submit sample corner section, 12” square, showing required veneer and edge construction.

E. Finish Samples - Factory Finished Doors: Submit three (3) flitch samples of each species of face veneer with factory applied stain and finish as specified and indicated illustrating expected range of color and grain variation.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store and protect doors in accordance with manufacturer’s recommendations and WDMA.
B. Following are general guidelines. For more specific information refer to WDMA's Appendix Section “Care and Installation at Job Site.”

1. Deliver doors in manufacturer's original unopened protective packaging or wrapper.
   a. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse.
   b. Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 50 to 90 degrees Fahrenheit and 30% to 50% relative humidity.
   c. When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle with clean hands or gloves.
   d. Each door will be marked on top rail with opening number.

1.06 LABEL DOOR REQUIREMENTS

A. Fire Ratings Compliance: Comply with the label requirements of NFPA and applicable local codes. Fabricate doors and frames in accordance with requirements of NFPA Standard No. 80 and U.L. Standards as follows:

1. Positive Pressure Testing UL 10C

B. Ratings Certifications

1. Provide U.L. labels permanently fastened on each door that is within the size limitations established by NFPA and U.L. for labeling.
2. Provide anchors for U.L. labeled frames required by the authority having jurisdiction.

1.07 WARRANTY

A. 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 Period for Solid-Core Exterior Doors: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. LEED Requirements
1. Provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".

2. Material and products to be manufactured regionally AND harvested, extracted, or recovered regionally within a radius of 500 miles from the project site.

B. Interior Flush Doors Solid Core: Meet or exceed WDMA I.S.1A Industry Standard for Wood Flush Doors requirements and as specified. WDMA I.S.1A. Performance Grade – Heavy Duty.

1. Interior Flush Doors Solid Core – Non-Rated and 20 Minute Rated Fire Doors: Provide one of the following cores with hardwood veneers:
   a. Stave Lumber Core (SLC-5) may be a combination of solid, low-density hardwood lumber blocks or strips not more than 2-1/2" wide of one species of wood between 6% to 9% moisture content. Joints to be tight and staggered in adjacent rows. Lumber density is 25 to 27 lbs. per cubic foot. Formaldehyde free.
   b. Structural Composite Lumber Core (SCLC-5) is an engineered hardwood composite sometimes referred to as LSL (Laminated Strand Lumber). The material complies with WDMA minimum performance levels for interior applications with screw holding power of 540 lbs., modulus of rupture of 6,500 psi, modulus of elasticity of 1,300,000 psi and density of 38 lbs per cubic foot. Formaldehyde free.

2. Interior Flush Fire Doors – Above 20 Minute Rated: FD solid core with hardwood face veneer.
   a. Rating as indicated on drawings.
   b. Provide one of the above cores or the following as required to maintain fire rating:
      1) Non-combustible mineral composite material that is necessary for higher hourly ratings per manufacturer's approval

B. Moldings: Trim louver and glass openings with recessed bead type wood moldings, species matching door face veneer species. Profiles as selected by the Architect from manufacturer's standard profiles.

1. Glass Lites in Fire Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

E. Louvers: Where scheduled, provide sightproof, fixed, welded, inverted V-shaped blade type, formed of 20 gage cold-rolled steel blades and frames, primed painted finish. ANEMOSTAT Model CHDL-2F, NATIONAL GUARD PRODUCTS Model L-A700-BF, AIR LOUVERS INC. 600 A-1.
2.02 FABRICATION

A. Flush Doors: Fabricate doors in accordance with WDMA I.S. 1A, Premium with Grade A faces. Grade requirements for transparent stained finish. Formaldehyde free.

1. Core Construction: Bond stiles and rails to core and sand entire unit prior to assembly of face veneers.
2. Number of Plies: 5.
3. Face Veneers: Minimum 1/50" thick before sanding, plain sliced, select white maple hardwood.
5. Adhesive: Type I, waterproof.
6. Edge Strips: Stile edges hardwood species matching face veneer; bonded to core; 1-1/8" minimum width after trimming. Top and bottom edges hardwood of mill option.
7. Match Between Veneer Leaves: Book matched for color and grain.
8. Assembly of Veneer Leaves on Door Faces: Running match.
9. Hardware: Factory machine for mortise hardware using template provided by hardware manufacturer.
10. Reinforcement: Reinforce doors to receive hardware specified.
   a. Hinge Attachment: Stiles and rails to be continuously glue bonded to the core so that screw stress is transmitted directly to the core.
   b. Closure, Exit Device and Other Surface Mounted Hardware: Provide top rail 2-1/2" or more in width to hold closer fasteners and solid wood blocking for all other surface applied hardware.

B. Fire Rated Doors: Conform to "Flush Door" requirements specified above. Provide doors of U.L. classification indicated.

1. Reinforcement: Reinforce doors to receive hardware specified.
   a. Surface applied hardware that is located where screws cannot penetrate the above mentioned stiles or wood rails shall be through bolted.

C. Factory Finish

1. 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.
   a. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
2. Finish: WDMA TR-4 conversion varnish.
4. Effect: Filled finish.
5. Sheen: Satin.

D. Individually package doors at factory with manufacturer's standard packaging or wrapping for delivery to job site.
PART 3 EXECUTION

3.01 INSPECTION

A. Examine substances, rough openings and installation conditions. Do not proceed with wood door installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Verify metal frame dimensions and hardware mortises in metal frames with metal frame manufacturer.

3.03 INSTALLATION

A. Condition doors to average prevailing humidity in installation area before hanging.

B. Install doors in accordance with manufacturer’s installation instructions. Job fit and prepare doors to receive hardware. Bevel 1/8” in 2” at strike edges for clearance in arc of swing. Seal cut surfaces, tops, bottoms and edges with sanding sealer after fitting and machining.

C. Hang doors straight, plumb and square securely anchored into position. Adjust doors to provide uniform clearance and to contact stops uniformly. Remove and replace doors that are warped, bowed or otherwise damaged and cannot be properly fit to the opening.

D. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.

3.04 PROTECTION

A. Protect installed doors from soiling, staining and damage until final acceptance.

B. Repair or replace doors damaged beyond acceptable repair as directed by the Architect.

END OF SECTION
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SECTION 08 16 13
FIBERGLASS DOORS

PART 1 GENERAL

1.01 DESCRIPTION
A. Work Includes:
   1. Exterior fiberglass (FRP) doors and aluminum frames. Work also includes
door hardware and glazing.

1.02 RELATED SECTIONS
A. Hollow Metal Doors and Frames: Section 08 11 13.
B. Door Hardware: Section 08 71 10.
C. Glass: Section 08 81 00.

1.03 SUBMITTALS
A. Product Data: Submit product data, specifications and installation instructions for
each type of door and frame.
   1. Include details of core, stile and rail construction, including trim for lites and
similar components.
   2. Include details of finish hardware mounting.
   3. Include 3 samples of each aluminum finish as required, of the type to be
used on this project. Where normal color and texture variations are
expected, include two or more units in each sample range as required to
show range of such variations.
      a. Architect withholds the right to require samples of typical fabricated
section, showing joints, exposed fastenings (if any), quality of
workmanship, hardware and accessory items, before fabrication.
B. Shop Drawings: Include the following:
   1. Door and frame fabrication, sections and details as required.
   2. Installation details, including frame relationship to supporting and adjacent
components.
   3. Door and frame elevations.
   4. Anchors, joint system, expansion provisions, and other components not
included in manufacturer’s standard product data.
   5. Glazing details.
C. Manufacturer’s certification of compliance with Texas Department of Insurance debris protection criteria.

1.04 SYSTEM PERFORMANCE

A. Provide exterior door assemblies that have been designed and fabricated to comply with system performance characteristics specified herein, as demonstrated by manufacturer's corresponding stock systems according to test methods designated.

1. Air Infiltration: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 283 at pressure differential of 6.27 psf. Door shall not exceed 0.58 cfm/ft².

2. Water Resistance: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.


4. Surface Burning Characteristics, FRP Doors, ASTM E84:
   a. Exterior Face: Class C
      1) Flame Spread: Maximum of 200.
      2) Smoke Developed: Maximum of 450.
   b. Interior Face: Class A
      1) Flame Spread: Maximum of 25.
      2) Smoke Developed: Maximum of 450.


7. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790: 21,000 psi.

8. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570: 0.20 percent after 24 hours.

B. Swinging Door Cycle Test, Doors and Frames, ANSI A250.4: Minimum of 25,000,000 cycles.

C. 90-Minute Full-Scale Vertical Fire Test of Doors, Positive Pressure: Complied with acceptance criteria for 90-minute rating.

1. UBC Standard 7-2.
2. NFPA 252.
3. UL 10C.

D. Door designed and tested to conform to Texas Department of Insurance debris protection criteria.

1.05 DELIVERY, STORAGE AND PROTECTION

A. Conform to manufacturer’s standard precautions. Include the following:
1. Deliver, handle and store doors and frames at the job site in such a manner as to prevent damage.
2. Do not receive doors before the building is enclosed.
3. Only remove cartons upon arrival of doors at job site if cartons are wet or damaged.
4. Store doors out of weather and/or extreme temperatures.
5. Store doors in a vertical position on blocking, clear of the floor and with blocking between the doors to permit air circulation between the doors.
6. Immediately remove all damaged or otherwise unsuitable doors and frames from the job site.

1.06 QUALITY ASSURANCE

A. Standards: Comply with requirements and recommendations in applicable specifications and standards by NAAMM, AAMA, and AA, including terminology definitions, and specifically including the "Entrance Manual" by NAAMM, except where more stringent requirements are specified.

B. Manufacturer's Qualifications: Minimum 10 years of experience in manufacturing fiberglass reinforced polyester doors. Must have a minimum of 5 projects within the last 3 years of similar or greater magnitude.

1.07 JOB CONDITIONS

A. Field Measurements: Take field measurements prior to fabrication of doors and frames to insure proper fit of assemblies.

1.07 WARRANTY

A. Provide manufacturer's written 5 year warranty to replace, at no cost to the Owner, doors, frames or hardware provided under this section, that fail in materials or workmanship. Failures of materials or workmanship includes excessive deflection, faulty operation of entrances, deterioration of finish or construction, in excess of normal weathering, and defects in hardware, weatherstripping, and other components of the work.

PART 2 PRODUCTS

2.01 EXTERIOR DOORS

A. Basis of Design: Specifications are based on Model SL-17 manufactured by SPECIAL-LITE.

B. Other Manufacturers: Subject to the specified requirements, products manufactured by the following are acceptable.

1. CAPITOL ALUMINUM & GLASS, FRP.
2. CLINE DOORS
3. KAWNEER

B. Construction
2. Stiles and Rails: Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes, minimum of 2-5/16-inch depth.
4. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom integral to standard tubular shaped stiles and rails reinforced to accept hardware as specified.
5. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable.
6. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
7. Rail caps or other face sheet capture methods are not acceptable.
8. Extrude top and bottom rail legs for interlocking continuous weather bar.
9. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
10. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.
11. Glue: Use of glue to bond sheet to core or extrusions is not acceptable.

C. Face Sheets: 0.12" minimum thickness, fiberglass reinforced polyester with pebble-like embossed finish. Color integral throughout.

1. Colors: As selected by Architect.

D. Core

2. Density: Minimum of 5 pounds per cubic foot.

E. Cutouts

1. Manufacture doors with cutouts for required vision lites, louvers, and panels.
2. Factory install vision lites, louvers, and panels.

F. Aluminum Frames - Materials and Construction

1. Members: .125" thick extruded aluminum, type 6063-T5 alloy. Provide depth and width as indicated. Provide with .625" high applied stops with integrated weatherstripping or glazing materials as required.
   a. Provide applied stops for side and transom with fasteners exposed on interior only. Reinforce and premachine frame members in contact with door for hardware per manufacturer's standards, approved hardware schedule and as specified herein.
2. Joints: Clip system arrangement for horizontal and vertical members.
3. Anchors: Provide type as suited to anchor framing system to wall structure. Provide minimum of 5 anchors for frames up to 7'-4" high. Provide additional anchors as recommended by manufacturer.
4. Provide knock-down frames for assembly at jobsite.

G. Glazing: Provide glazing system for doors and frames to receive lites. Design system for interior glass replacement.
   1. Provide system to receive 1/4" plastic glazing as specified in Section 08 81 00.
   2. Factory glaze doors and frames in factory to greatest extent possible.

H. Aluminum Finishes
   1. All exposed aluminum surfaces shall receive an Architectural Class 1, medium bronze anodized coating; AA-M12C22A42, minimum 0.7 mil thickness.
   2. Concealed members may be mill finished, providing they cannot be seen through the glass.

I. Hardware
   1. Reinforce, cut, drill and tap doors and frames as required to receive hardware, except do not drill and tap for surface mounted closers, which are to be applied at the jobsite. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
   2. Finishes: Except where indicated or specified, hardware finishes shall match finish of door and frame assembly.
   3. Types of Hardware
      a. Hinges: Continuous geared type.
      b. Remaining Hardware: Specified in Section 08 71 10.

J. Fasteners
   1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.
   2. Compatibility: Compatible with items to be fastened.
   3. Exposed Fasteners: Screws with finish matching items to be fastened.

2.03 FABRICATION

A. Fabricate FRP doors and frames as shown on the drawings. Provide frames rigid, neat in appearance and free from defects. Take field measurements as required for coordination with adjoining work.

B. Form exposed surfaces free from warp, wave and buckle, with all corners square, unless otherwise shown. Set each member in proper alignment and relationship to other members with all surfaces straight and in a true plane.

C. Reinforce members and joints with plates, tubes or angles for rigidity and strength.
D. Mortise and reinforce doors and frames for hardware in accordance with the hardware manufacturer’s instructions and templates. Design reinforcing to receive hinges, locks, strikes, closures, etc.

E. Provide mortar guard boxes for hardware cutouts in frames.

F. Provide at least three (3) metal anchors or polymer spacers in each jamb of frames up to 84" high and one (1) additional anchor for each 24" in height above 84", in shapes, sizes and spacing shown or required for anchorage into adjoining wall construction. Fabricate joint anchor of stainless steel.

G. Terminate bottom of frames at the indicated finished floor level.

PART 3 EXECUTION

3.01 INSPECTION

A. Installer: Examine the substrate and conditions under which fiberglass reinforced plastic work is to be installed and notify the General Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.01 INSTALLATION

A. Comply with manufacturer's recommendations and specifications.

B. Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate aluminum from sources of corrosion or electrolytic action at points of contact with other materials, with bituminous coatings.

C. Provide protective treatment and other precautions required throughout remainder of construction period.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/8" measured with a straight edge, corner to corner. Maximum measurable plane is 4'-0" x 7'-0".

B. Provide clearance for doors of 1/8" at jambs and heads; 1/4" clearance above threshold.

3.04 ADJUSTING

A. At substantial completion, adjust all operable components to ensure proper installation and that they function smooth and freely.
3.05 CLEANING

A. Remove dirt and excess sealant from exposed surfaces. Follow the manufacturer’s recommended cleaning techniques and procedures for cleaning all surfaces. Use only cleaning products that will not scratch or damage the surfaces, and are recommended by the manufacturer.

B. Remove debris from project site.

END OF SECTION
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SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1  GENERAL

1.01  WORK INCLUDED
   A. Provide complete operating doors assemblies, including door curtains, guides, counterbalance mechanism, hardware, operators and installation accessories.
   B. Types of overhead coiling doors include:
      1. Insulated service door, motor operated, face-of-wall mounted.
      2. Service door, motor operated, face-of wall mounted.
      3. Counter door, manual operated, face-of wall mounted.

1.02  RELATED SECTIONS
   A. Sustainable Design Requirements: Section 01 81 13.
   B. Structural steel frame members: Section 05 50 00.
   C. Electrical: Division 26.

1.03  QUALITY ASSURANCE
   A. Quality Control: Provide overhead coiling doors as complete units produced by a single manufacturer specializing in the production of this type of work, including hardware, accessories, mounting and installation components. Provide all door assemblies by a single manufacturer for entire project.
   B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
   C. Inserts and Anchors: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of the units. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.
   D. 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.
1.04 PERFORMANCE REQUIREMENTS

A. Delegated Design – Exterior Doors: Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
   1. Design Wind Load: 50 psf.
   2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
   3. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

C. Windborne-Debris-Impact-Resistance Performance: Provide impact-protective overhead coiling doors that pass missile-impact and cyclic-pressure tests when tested according to ASTM E1886 and ASTM E1996.
   1. Large Missile Test: For overhead coiling doors located within 30 feet of grade.

D. Operation-Cycle Requirements: Design overhead coiling door components and operator to operate for not less than 20,000 cycles. 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.

E. Exterior Doors conform to Texas State Board of Insurance Windstorm Regulations; GDR-31.

1.05 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. Motor Operated Doors: Include wiring diagrams, control layouts and electrical requirements.

C. Delegated-Design Submittal – Exterior Doors: For overhead coiling doors 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. Summary of forces and loads on walls and jambs.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by CORNELL, C.H.I. OVERHEAD; COOKSON; McKEON, OVERHEAD DOOR CORPORATION or WAYNE DALTON.

2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtain: Fabricate all overhead coiling door curtains of interlocking flat slats of continuous length for width of door without splices. Provide slats of material gage recommended by the manufacturer for size and type of door required, and as follows:

1. Steel Slat Material: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A653, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch and as required to meet requirements.
   a. Recycled content: Minimum 75 percent, with minimum 40 percent classified as post consumer.

2. Insulated Curtain: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 0 and 10, respectively, according to ASTM E84. Enclose insulation completely within slat faces. Provide with manufacturer's standard galvanized steel backing enclosing polyurethane insulation. U-value of maximum 1.25.

3. Counter Door: 1 ½” interlocking roll formed with flat face.

C. Endlocks: Provide locks for curtain alignment and resistance against lateral movement. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

D. Windlocks: Provide malleable iron castings secured to curtain slats with galvanized rivets. Space windlocks as required by door size and design wind load.
1. Provide on exterior doors and interior doors exposed to wind loads.

E. Bottom Bar

1. Service Door: Consisting of angles, not less than 1-1/2" x 1-1/2" x 1/8'', material and finish to match curtain.
2. Counter Doors: Manufacturer's standard continuous channel or tubular shape, material and finish to match curtain.

F. Curtain Jamb Guides: Structural steel, form slot of sufficient depth to retain curtain in guides against design wind loads.

1. Secure to wall or framing by 3/8'' minimum bolts at not more than 30'' o.c., unless closer spacing recommended by door manufacturer. Extend wall angles above door opening head to support coil brackets, unless otherwise shown. Provide removable stops on guides to prevent over-travel of curtain and continuous bar for holding windlocks of exterior curtains.

G. Counter Doors Jamb Guide: Two piece extruded aluminum or steel shape slide rail assemblies that bolt to wall and support weight of door unit.

H. Locking

1. 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 door side.
2. Cylinder Lock: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
   a. Lock Cylinders: Cylinders specified in Section 08 71 00; keyed to building keying system.
3. Safety Interlock Switch: Equip power-operated grilles with safety interlock switch to disengage power supply when door is locked.

H. Weather Seals: Provide vinyl or neoprene weatherstripping. At door head, use 1/8'' thick continuous sheet secured to inside of curtain coil hood. At door jambs, use 1/8'' thick continuous strip secured to exterior side of jamb guide.

1. Provide on doors with insulated curtains.
2. Conform to ASHRAE 90.1 and IECC 2012 Section C402.4.3 air leakage requirements.

I. Automatic Reversing Control: Furnish each motor operated door with automatic safety switch, extending full width of door bottom, and located within neoprene or rubber astragal mounted to bottom door rail. Contact with switch before fully closing will immediately stop downward travel and reverse direction to fully opened position. Connect to control circuit through retracting safety cord and reel, or self-coiling cable.
2.03 COUNTERBALANCING MECHANISM

A. Counterbalance doors by means of adjustable steel helical torsion spring, mounted around a steel shaft and mounted in a spring barrel.

1. Connect to door curtain with the required barrel rings.
2. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Barrel: Hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up of curtain without distortion of slats and limit barrel deflection to not more than 0.03" per foot of span under full load.

C. Provide spring balance on all doors consisting of one or more oil-tempered steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.

1. Fabricate torsion rod for counterbalance shaft of case-hardened steel, of required size to hold fixed spring ends and carry torsional load.

D. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate with bell mouth guide groove for curtain.

E. Hood – Service Doors: Form to entirely enclose coiled curtain, operating mechanism and end brackets at opening head. Contour to suit end brackets. Roll and reinforce top and bottom edges. Provide closed ends for surface-mounted hoods, and any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.


2.04 OPERATION

A. Motor Operation

1. Type: Jackshaft type, pre-wired and assembled.
2. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory-prewired motor controls, gear reduction unit, solenoid operated brake, clutch, remote control stations and accessories required for proper operation.
3. Door Operator Type: Provide wall or bracket-mounted door operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to gear wheel mounted on counterbalance shaft, and a disconnect-release for manual operation.
Provide motor and drive assembly of horsepower and design as determined by door manufacturer for size of door required.

4. Electric Motors: Provide high-starting torque, reversible, constant duty, Class A insulated electric motors with overload protection, sized to move door in either direction, from any position at not less than 2/3' nor more than 1' per second.
   a. Power: 120v, 1 phase, 60Hz; motor horsepower sized for application, minimum 1 HP.
   b. Motor shall be separate from reduction mechanism.

5. Controls
   a. Provide momentary-contact, 3-button control station labeled "open", and "stop"; continuous hold button for "close"; install at locations indicated. Provide key operated switches where indicated.
   b. Interior Exposure: Push-button station; NEMA 1-3, position type.
   c. Exterior Exposure: Provide full-guarded surface-mounted heavy duty interior units with weatherproof NEMA 4 stainless steel.


2.05 STEEL AND GALVANIZED STEEL FINISHES

A. Shop paint galvanized steel slats, bottom bars, guides, hoods and endplates with baked-on organic polymer thermosetting powder coating applied over conversion coating.

B. Finish Coating Properties

1. Hardness: H or better in accordance with ASTM D3363.
2. Crosshatch Adhesion: In accordance with ASTM D3368.
3. Salt Spray Resistance: 1,000 hours, tested in accordance with ASTM D117.
4. Humidity Resistance: 1,000 hours tested in accordance with ASTM D2247.
5. Detergent Immersion: 1,000 hours tested in accordance with ASTM D2248.

C. Colors: As selected by Architect.

PART 3 EXECUTION

3.01 INSPECTION

A. Installer must examine the supporting structure and the conditions under which the work is to be performed and notify the Architect in writing of conditions which are detrimental to proper and timely completion of the work.

B. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
3.02 INSTALLATION

A. Install doors and operating equipment complete with necessary hardware, guides, hoods, anchors, inserts, hangers and equipment supports in accordance with manufacturer's instructions and recommendations.

3.03 FIELD ADJUSTMENT

A. Upon completion of installation including the work by other trades, test and adjust doors to operate easily, free from warp, twist or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide weathertight fit around entire perimeter.

END OF SECTION
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SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1  GENERAL

1.01  WORK INCLUDED

A. Work under this section includes the design of the aluminum entrance and window systems and all materials, labor and equipment for the complete installation of the work as shown on the drawings and specified herein. Work includes:

1. Aluminum entrance doors.
2. Aluminum entrance framing system.
3. Aluminum storefront and fixed window system.
4. Glass and glazing of the systems.
5. Anchors, fasteners, flashings, trim and accessories to complete the work.
6. Sealants required within entrance and window construction.
7. All gaskets, sealants and tapes required in final assembly of the work.

1.02  RELATED SECTIONS

A. Sustainable Design Requirements:  Section 01 81 13.
B. Joint Sealants:  Section 07 92 00.
C. Glazing:  Section 08 81 00.
D. Hardware: Section 08 71 00.

1.03  QUALITY ASSURANCE

A. Provide aluminum doors and framing system manufactured by a single firm specializing in the production of this type of work.
B. Installer Qualifications: Manufacturer’s authorized representative who is trained and approved for installation of units required for this Project.
C. Painted Finishes: Factory painted finish to be performed by an applicator specifically approved by the paint manufacturer. The applicator shall provide written notification of approval by paint manufacturer prior to application of the finish.

1.04  SUBMITTALS

A. Submit the following:
1. Framing system details.
2. Door details.
3. Installation instructions.
4. Finish samples.

B. Tests: Submit two copies of test reports made or witnessed by an independent testing laboratory showing the results of tests conducted on previously manufactured windows of the type used on this project. The reports shall verify conformance to thermal movement, air and water infiltration and structural properties as described herein.

C. Building Shop Drawings: Include complete evaluations of all systems; details and methods of anchorage; details of construction finishes; methods of assembly; location and installation of hardware and reinforcement for same; size, shape and thickness of materials; joints and connections; details of joining with other work.

1. Scale: Include typical unit elevation of each system at 1/2" scale and details at full scale where practical.

D. Product Data: Submit manufacturer's specifications for materials and fabrication of work, and instructions and recommendations for installation and maintenance. Include certified test reports showing compliance with requirements where a test method is indicated.

E. Samples: Submit samples of each type and color and finish required by this Section, on 12" sections of extrusions or formed shapes and on 6" squares of sheet/plate. Include two or more samples in each set.

1. Architect reserves right to require fabrication samples showing prime members, joinery, anchorage, expansion provisions, glazing and similar details, profiles and intersections.

F. Submit for LEED Credit documentation.

1. Refer to Section 01 8113 “Sustainable Design Requirements” for additional LEED submittal requirements.
2. Product Data for Credit MRC4: For products having recycled content, provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating material costs for each product having recycled content.
3. Product data for Credit MRC5: For products having regional content:
   a. Provide documentation indicating location of manufacturer of product. If only a fraction of the material is manufactured regionally, indicate fraction as a percentage product’s total weight.
   b. Provide documentation indicating location of extraction, harvest or recovery of raw material in product. If only a fraction of the material is extracted, harvested or recovered regionally, indicated fraction as a percentage of product’s total weight.
   c. Include statement indicating material costs for each product having regional content.
4. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building’s weatherproofing system.

5. Product Data for Credit EQ4.2: Provide documentation indicating VOC content of product for all paints, primers and coatings applied on-site and interior of the building’s weatherproofing system.

1.05 DELIVERY, STORAGE AND HANDLING

A. Pack, deliver, handle, store and protect materials from damage in accordance with AAMA Curtain Wall #10, "Care and Handling of Architectural Aluminum" recommendations.

1. Remove paper type wrappings when unloading.
2. Store materials inside the buildings whenever possible in clean, dry ventilated areas free of dust or corrosive fumes.
3. Stack members vertically or on edge, shim between components to provide water drainage and ventilation. Protect with adequate coverings, placed to provide adequate air circulation.
4. During installation, protect materials from lime mortar, run-off from concrete and copper, weld splatter, acids, roofing materials, solvents and abrasive cleaner.

1.06 PROJECT CONDITIONS

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

1.07 WARRANTIES

A. Submit written warranty signed by manufacturer, Contractor, and installer agreeing to repair or replace work which fails in materials or workmanship within two (2) years of the date of project acceptance.

1. Failure of materials or workmanship shall include excessive leakage or air infiltration, excessive deflections and defects in accessories, weather seals and other components of work.

B. Finish: Provide paint manufacturer's guarantee of paint finish against failure of paint finish. Failure includes blistering, peeling, cracking, flaking, checking, excessive color change and chalking. Color change shall not exceed 5 N.B.S. units (per ASTM D523) and chalking shall not less than a rating of 8 per ASTM D4214.

1. Warranty Period: 20 years.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Drawings and specifications are based on products by YKK AP AMERICA.

B. Other Manufacturers: Subject to compliance with requirement, products by the following manufacturers are acceptable:

1. CRL – U.S. ALUMINUM
2. KAWNEER
3. OLDCASTLE BUILDING ENVELOPE
4. TUBELITE DIVISION, INDAL, INC.

2.02 MATERIALS

A. Extrusions: ASTM B221, 6063-T5 Aluminum Alloy.

B. Aluminum Sheet

1. Anodized Finish: ASTM B209, 5005-H14 Aluminum Alloy, 0.050" minimum thickness.
2. Painted Finish: ASTM B209, 3003-H14 Aluminum Alloy, 0.080" minimum thickness.

2.03 STOREFRONT, WINDOW AND ENTRANCE FRAMING SYSTEM

A. Type: An integrated system of extruded aluminum sections, glazing devices, sealing devices.


B. Framing System

1. Description: Center set, exterior flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal attached by screw spline joinery. Continuous and wet sill flashing.
2. Components: Manufacturer's standard extruded aluminum mullions, entrance doors, framing, and indicated shapes, perimeter anchor fillers and steel reinforcing as required.
3. Glazing: Manufacturer's standard glazing stops with EPDM glazing gaskets to prevent water infiltration at the exterior and structural silicone sealant with fixed stops at the interior.
4. Thermal Barrier: Provide continuous thermal barrier by means of a poured and debridged pocket consisting of a two-part, chemically curing high density polyurethane bonded to the aluminum.
C. Glass: 1-5/16" insulating glass unit consisting of 1/4" heat strengthened or tempered as required with 0.034 low emissivity coating on surface #2, 1/2" air space with aluminum spacer and 1/4" heat strengthened / 0.090 PVB interlayer / 1/4" heat strengthened.

D. Performance Requirements: Provide aluminum storefront systems that meet all Texas State Board of Insurance Windstorm Regulations and requirements of South Florida Building Code Protocols TAS 201, TAS 202, and TAS 203 comply with the following specific performance requirements indicated.

1. Air Infiltration: Completed storefront systems shall have 0.06 CFM/FT² maximum allowable infiltration when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf.

2. Water Infiltration: No uncontrolled water when tested in accordance with ASTM E331 at test pressure differential of: 12 PSF (or when required, field tested in accordance with AAMA 503). Fastener Heads must be seated and sealed against Sill Flashing on any fasteners that penetrate through the Sill Flashing.

3. Wind Loads: Completed storefront system shall withstand wind pressure loads normal to wall plane indicated:
   a. Exterior Walls:
      1) Positive Pressure: 70 psf.
      2) Negative Pressure: 70 psf.

4. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330 with allowable stress in accordance with AAMA Specifications for Aluminum Structures.
   a. For spans less than 13'-6": L/175 or 3/4" maximum.
   b. For spans greater than 13'-6" but less than 40'-0": L/175 or L/240 + 1/4".

5. Thermal Movement: Provide for thermal movement caused by 180 degrees F surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.

6. Thermal Performance
   a. Condensation Resistance Factor (CRF): A minimum of 59 when tested in accordance with AAMA 1503.1.
   b. Thermal Transmittance U-Factor: 0.45 BTU/HR/FT²/°F or less when tested in accordance with NFRC 102.

Note: Thermal performance depends on glass specified. U-Factor shown for system when using a 1-11/32" insulating glass unit - 1/4" heat strengthened as required with 0.034 low emissivity coating on surface #2, 1/2" air space with aluminum spacer, 1/4" heat strengthened / 0.090 PVB interlayer / 1/4" heat strengthened. Size: 2000mm x 2000mm (78.7 inches x 78.7 inches).

2.04 ENTRANCE DOORS

A. Impact Resistant Entrances: An integrated system of extruded aluminum sections, glazing devices, sealing devices.

B. Description

1. Stiles: 5"
2. Thickness: 2-3/8".
3. Corner Construction: Fabricate door corners joined by concealed reinforcement secured with screws and sigma deep penetration welding.
4. Glazing: Manufacturer's standard glazing stops with EPDM glazing gaskets to prevent water infiltration at the exterior and structural silicone sealant for wet glazing, EPDM silicone compatible gasket for dry glazing with fixed stops at the interior.
5. Weather-stripping: Manufacturer's standard elastomer type in replaceable rabbets for stiles and rails.

C. Hardware: See Section 08 71 00.

D. Glass: 1-11/32" insulating glass unit consisting of 1/4" heat strengthened or tempered as required with 0.034 low emmissivity coating on surface #2, 1/2" air space with aluminum spacer and 1/4" heat strengthened / 0.090 PVB interlayer / 1/4" heat strengthened. See Section 08 81 00.

E. Performance Requirements: Provide aluminum storefront systems that meet all Texas State Board of Insurance Windstorm Regulations and requirements of South Florida Building Code Protocols TAS 201, TAS 202, and TAS 203 comply with the following specific performance requirements indicated.

1. Air Infiltration: Air infiltration shall be tested in accordance with ASTM E283 at static pressure of 1.57 PSF. Infiltration shall not exceed 0.50 CFM/FT² for single door or 1.00 CFM/FT² for pair doors.
2. Water Infiltration: No uncontrolled water other than condensation on indoor face of any component tested in accordance with ASTM E 331 at a test pressure differential of 10.5 psf. Water test to be performed immediately after design pressure test. Standard 50H Entrances are intended for 1st floor applications.
3. Structural Uniform Load Test:
   a. Doors
      1) Positive Pressure: 90 PSF – For Air Only Threshold.
         70 PSF – For Air and Water Threshold
      2) Negative Pressure: 90 PSF
4. Forced Entry Resistance: Tests performed simultaneously with 300 lb. forces applied to the active door panel within 3" of the locks in the direction that would tend to open the door while 150 lb. forces are applied in both perpendicular directions to the 300 lb. force simultaneously.
5. Thermal Performance: When tested in accordance with AAMA 1503 and NFRC 102:
b. Thermal Transmittance U Value: 0.77 BTU/HR/FT²/ºF or less.

2.05 FINISHES

A. Finish: Fluoropolymer baked enamel finish with Kynar 500 (70%) resins by ELF ATOCHEM OF NORTH AMERICA INC.; "Trinar" by AKZO; "Duranar" by PPG; "Fluropon" by VALSPAR. Total dry film thickness not less than 1.0 mils, or coatings meet or exceed the requirements of AAMA 2605.

1. Color: As selected by Architect from paint manufacturer's complete specified line.
3. Concealed members may be mill finished, providing they cannot be seen through the glass.

2.06 ENTRANCE DOOR HARDWARE

A. Prepare and reinforce doors and frames for hardware. Factory fit and install hardware in accordance with Section 08 71 10 and manufacturer's requirements.

2.07 ACCESSORIES

A. Fasteners: Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components. Finish exposed fasteners to match aluminum work.

B. Flashing, Trim and Accessories: Provide as required to complete the work. Finish shall match aluminum entrances and storefront finishes. Work includes:

1. Aluminum closure panels, flashing and trim.
2. Concealed Flashing: Dead-soft stainless steel, 26 gauge minimum, type selected by manufacturer for compatibility.
3. All trim materials shall be finished after fabrication, unfinished exposed edges at holes and trim terminations are not acceptable.

C. Brackets and Reinforcements: Manufacturer's high strength aluminum units where feasible; otherwise, nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A123.

D. Bituminous Coatings: Cold applied asphalt mastic complying with SSPC PS 12, compounded for 30 mil thickness per coat.

E. Structural Sealant: Designed to carry gravity loads of glazing and capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront/strip windows without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
1. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront/strip windows assembly indicated.
   a. Color: As selected by Architect from manufacturer's full range of colors.

2. Sealants used inside the weatherproofing system 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."

2.08 FABRICATION

A. Provide manufacturer's standard fabrication and accessories that comply with indicated requirements. Minor dimension differences will be accepted in order to utilize manufacturer's standard products.

B. Fit and assemble the work at the shop to the greatest extent possible. Disassemble only as required for shipment and erection. Maintain true continuity of line and accurate relation of planes and angles. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members. Conceal fasteners wherever possible.

C. Reinforce aluminum work as necessary at points of support or anchorage and at mechanical joints and points of attachment to meet performance requirements and for support of the system. Separate dissimilar metals with bituminous paint or preformed separators that will prevent corrosion. Separate metal surfaces at moving joints with plastic inserts or other non-abrasive concealed inserts.

D. Coordinate work of this section with other work for proper sequence of construction without delays. Verify dimensions of supporting structure and other elements that precede wall system work before fabrication of required components. Provide for erection tolerances for other work where field measurements cannot be obtained.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates supporting structure, and installation conditions. Do not proceed with aluminum entrances erection until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. General
1. Do not install component parts that are observed to be defective, including warped, bowed, dented, abraded and broken members.
2. Remove and replace members that have been damaged during installation or thereafter before time of acceptance.
3. Do not cut or trim component parts during erection, in a manner which would damage finish, decrease strength or result in a visual imperfection or a failure in performance of the work.

B. Install components in accordance with the manufacturer’s installation instructions and recommendations.

C. Install component parts level, plumb, true to line and with uniform joints and reveals. Secure to structure with non-staining and non-corrosive shims, anchors, fasteners, spacers and fillers.

D. Assembly and Anchorage: Anchor component parts securely in place, by bolting or other permanent mechanical attachment system, which will comply with performance requirements and permits movements as required.

E. Apply a bituminous coating or other suitable separator on concealed contact surfaces of dissimilar materials, before assembly or installation to prevent corrosive or electrolytic action.

F. Set sill members and entrance thresholds in a bed of sealant compound, or with joint fillers or gaskets to provide weathertight requirements.

G. Install glass and glazing, in accordance with Section 08 81 00 and the manufacturer’s requirements.

H. Install joint sealants specified in Section 07 92 00, in accordance with the manufacturer’s requirements.

I. Coordinate installation of storefront framing with installation of air/vapor barrier transition membrane.

J. Adjust operating hardware to function properly, without binding, and to provide tight proper fit at contact points and weatherstripping.

3.03 CLEANING AND PROTECTION

A. Protect glass from breakage immediately upon installation, by attachment of streamers to framing held away from glass. Do not apply markings of any type to surfaces of glass.

B. Remove protective coating when completion of construction activities no longer require its retention.
C. Immediately before acceptance of the work, clean the aluminum entrance systems thoroughly, inside and out. Demonstrate proper cleaning methods to Owner's maintenance personnel during final cleaning. Prepare a "Cleaning and Maintenance Manual" listing types of cleaning compounds, cleaning methods, sealants and glazing materials used for cleaning, repair and maintenance of work and turn over to Owner upon acceptance of the work.

END OF SECTION
PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide aluminum storefront systems as shown and specified. Work includes:
   1. Aluminum framing.
   2. Glass and glazing of the systems.
   3. Anchors, fasteners, flashings, trim and accessories to complete the work.
   4. Sealants required within storefront construction.
   5. All gaskets, sealants and tapes required in final assembly of the work.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. Joint Sealants: Section 07 92 00.

C. Aluminum-Framed Entrances and Storefronts: Section 08 41 13.

D. Glazed Aluminum Curtainwall: Section 08 44 13.

E. Glass and Glazing: Section 08 81 00.

1.03 REFERENCES

A. Architectural Aluminum Manufacturer's Association (AAMA)

B. American Society for Testing and Materials (ASTM)

1.04 QUALITY ASSURANCE

A. Provide interior aluminum storefront systems manufactured by a single firm specializing in the production of this type of work.

1.05 SUBMITTALS

A. Submit the following:
   1. Framing system details.
   2. Installation instructions.
   3. Finish samples.
B. Submit for LEED Credit documentation.

1. Refer to Section 01 8113 “Sustainable Design Requirements” for additional LEED submittal requirements.
2. Product Data for Credit MRC4: For products having recycled content, provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating material costs for each product having recycled content.
3. Product data for Credit MRC5: For products having regional content:
   a. Provide documentation indicating location of manufacturer of product. If only a fraction of the material is manufactured regionally, indicate fraction as a percentage product’s total weight.
   b. Provide documentation indicating location of extraction, harvest or recovery of raw material in product. If only a fraction of the material is extracted, harvested or recovered regionally, indicated fraction as a percentage of product’s total weight.
   c. Include statement indicating material costs for each product having regional content.
4. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building’s weatherproofing system.
5. Product Data for Credit EQ4.2: Provide documentation indicating VOC content of product for all paints, primers and coatings applied on-site and interior of the building’s weatherproofing system.

1.06 DELIVERY, STORAGE AND HANDLING

A. Pack, deliver, handle, store and protect materials from damage in accordance with AAMA Curtain Wall #10, "Care and Handling of Architectural Aluminum" recommendations.

1. Remove paper type wrappings when unloading.
2. Store materials inside the buildings in clean, dry ventilated areas free of dust or corrosive fumes.
3. Stack members vertically or on edge, shim between components to provide water drainage and ventilation. Protect with adequate coverings, placed to provide adequate air circulation.
4. During installation, protect materials from lime mortar, run-off from concrete and copper, weld splatter, acids, roofing materials, solvents and abrasive cleaner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.

B. Minimum 25% recycled content.

C. Material and products to be manufactured regionally AND harvested, extracted, or recovered regionally within a radius of 500 miles from the project site.

2.02 STOREFRONT SYSTEM

A. Type: An integrated system of extruded aluminum sections, glazing devices, sealing devices.

B. Framing: YKK AMERICA YES 40 FS, 1-3/4" x 4-1/2" members. Equal products by KAWNEER, VISTAWALL; EFCO, or TUBELITE are acceptable provided they comply with requirements stated herein.

1. Provide complete with snap-in glazing stops and gaskets for the thicknesses of glass units indicated or specified.

C. Provide door frame extrusions as required to fit in storefront framing system or as individual framed opening as scheduled.

2.03 FINISHES

A. All exposed aluminum surfaces shall receive an Architectural Class 1, clear anodized coating; AA-M12C22A41, minimum 0.7 mil thickness.

2.04 ACCESSORIES

A. Fasteners: Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components. Finish exposed fasteners to match aluminum work.

B. Brackets and Reinforcements: Manufacturer's high strength aluminum units where feasible; otherwise, nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A123.

C. Bituminous Coatings: Cold applied asphalt mastic complying with SSPC PS 12, compounded for 30 mil thickness per coat.

D. Clear Protective Coatings: Provide aluminum surfaces covered with strippable surfacing designed specifically for protection of aluminum finish.

2.05 FABRICATION

A. Aluminum Storefronts: Provide manufacturer's standard fabrication and accessories which comply with indicated requirements. Minor dimension differences will be accepted in order to utilize manufacturer's standard products.
B. Shop fabricate aluminum storefront systems. Fit and assemble the work at the shop to the greatest extent possible. Disassemble only as required for shipment and erection. Maintain true continuity of line and accurate relation of planes and angles. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members. Conceal fasteners wherever possible.

C. Reinforce aluminum work as necessary at points of support or anchorage and at mechanical joints and points of attachment to meet performance requirements and for support of the system. Separate dissimilar metals with bituminous paint or preformed separators which will prevent corrosion. Separate metal surfaces at moving joints with plastic inserts or other non-abrasive concealed inserts.

D. Coordinate aluminum storefront systems work with other work for proper sequence of construction without delays. Verify dimensions of supporting structure and other elements which precede wall system work before fabrication of required components. Provide for erection tolerances for other work where field measurements cannot be obtained.

**PART 3 EXECUTION**

3.01 INSPECTION

A. Examine substrates supporting structure, and installation conditions. Do not proceed with aluminum storefront erection until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. General

1. Do not install component parts which are observed to be defective, including warped, bowed, dented, abraded and broken members. Remove and replace members which have been damaged during installation or thereafter before time of acceptance.

2. Do not cut or trim component parts during erection, in a manner which would damage finish, decrease strength or result in a visual imperfection or a failure in performance of the work.

B. Install the aluminum storefront systems in accordance with the manufacturer's installation instructions and recommendations.

C. Install component parts level, plumb, true to line and with uniform joints and reveals. Secure to structure with non-staining and non-corrosive shims, anchors, fasteners, spacers and fillers.
D. Assembly and Anchorage: Anchor component parts securely in place, by bolting or other permanent mechanical attachment system, which will comply with performance requirements and permits movements as required.

E. Apply a bituminous coating or other suitable separator on concealed contact surfaces of dissimilar materials, before assembly or installation to prevent corrosive or electrolytic action.

F. Install aluminum storefront system glass and glazing, in accordance with Section 08 81 00 and the manufacturer's requirements.

G. Install joint sealants within the aluminum storefront systems work with elastomeric joint sealants specified in Section 07 92 00, in accordance with the manufacturer's requirements.

3.03 CLEANING AND PROTECTION

A. Protect glass from breakage immediately upon installation, by attachment of streamers to framing held away from glass. Do not apply markings of any type to surfaces of glass.

B. Remove protective coating when completion of construction activities no longer require its retention.

C. Immediately before acceptance of the work, clean the aluminum storefront systems thoroughly. Demonstrate proper cleaning methods to Owner's maintenance personnel during final cleaning. Prepare a "Cleaning and Maintenance Manual" listing types of cleaning compounds, cleaning methods, sealants and glazing materials used for cleaning, repair and maintenance of work and turn over to Owner upon acceptance of the work.

D. Prepare a "Cleaning and Maintenance Manual" listing types of cleaning compounds, cleaning methods, sealants and glazing materials used for cleaning, repair and maintenance of work and turn over to Owner upon acceptance of the work.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY:

A. Furnish and deliver all items of finish hardware required to adequately trim and hang all doors, also hardware as specified herein and as enumerated in “Set Numbers” and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, special bolts, expansion shields and all other devices necessary for the proper application of the hardware.

B. RELATED SECTIONS:
The following items are covered in other sections:

1. Rough/Finish Carpentry
2. Metal Doors and Frames
3. Wood Doors
4. Aluminum Entrances
5. Electrical
6. Security

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets.

1. Overhead Doors (except cylinders where scheduled)
2. Cabinets of all kinds, including open wall shelving and locks.
3. Windows
4. Signs, except as noted.
5. Toilet accessories of all kinds including grab bars.

1.02 REFERENCES:

Finish hardware in this section shall meet the following standards as established by and the standard latest revision will be effect:

1. The Door and Hardware Institute (DHI) Various Publications
2. American National Standards (ANSI)/Builders Hardware Manufacturer Association (BMHA)
3. National Fire Prevention Association (NFPA)
   a. NFPA 80 Standard for Fire Doors and Fire Windows
   c. NFPA 105 Smoke and Draft Control Door Assemblies
4. CABO/ANSI A117.1 Accessible and Usage Buildings and Facilities
5. Underwriters Laboratories (UL)
   a. UL 10C – Fire Tests of Door Assemblies
   b. UL 305 – Panic Hardware
6. Applicable State and Local Building Codes
7. American Disabilities Act (ADA) – 1990 Civil Law

1.03 SUBMITTALS:

A. Schedules:
The finish hardware supplier shall, upon award of the contract, furnish six (6) copies of a completely detailed schedule of finish hardware in the Door and Hardware Institute’s Sequence and Format for approval within 30 days. Hardware schedule to be complete with Title page, Door Index/Keying Schedule and Manufactures legend. After “Approval” provide six (6) copies, unless otherwise requested, of the corrected, revised and approved schedule for field use, distribution and files. Provide one (1) copy complete with Catalog Cuts, marked “Installers Copy” and deliver it to the job site.

B. Product Data:
Provide a catalog cut, clearly marked and identified, illustrating and describing each product included in the hardware schedule. Formulate these catalog cuts into sets and include a set with each copy of the hardware schedule submitted.

C. Samples:
If so requested by the Architect, provide a sample of any product or item requested, properly marked and tagged, for the opening for which it is intended. After examination and approval by the Architect, the sample shall be turned over to the General Contractor, for incorporation into the project.

D. Templates:
Upon “Approved” copies of the hardware schedule, provide a complete “Template List”. Further and upon request, provide copies to manufacturers or trades, whose work includes preparation of their products, to receive hardware. Provide copies of all such transmittals to the contractor, for their files. If physical samples are required, the manufacturer may request it from the general contractor and assume all responsibility of shipping it complete to the project.

E. Keying:
The hardware supplier shall meet with owner and/or architect to establish keying requirements. Provide a keying schedule, listing the levels of keying, (GMKD, MKD, Keyed alike, etc.) as well as an explanation of the key’s function, the symbols used and the numbers of the doors controlled. This shall be provided in reference to the Door and Hardware Institute’s manual “Keying Systems and Nomenclature”. Also in conjunction the Door Index/Keying Schedule (which lists the door number, schedule heading, lock type and individual key symbol and remarks or special instructions) mentioned in paragraph “B”, Schedules.

F. Wiring Diagrams:
Unless otherwise specifically stated, for any electrified hardware furnished on this project, provide complete point to point wiring diagrams along with riser drawings and elevations, showing locations where such material is to be installed. Also check with the system installer as to the scope of their work.

G. Operations and Maintenance Data:
At the completion of the project, provide an Owner’s Operation and Maintenance Manual. The manual shall consist of a hard three ring binder. Include a copy of the latest revised and updated schedule of finish hardware, complete with catalog cuts and keying.
schedule. In addition, furnish one copy of maintenance and parts manual, for those items, for which they are readily available and normally provided.

1.04 QUALITY ASSURANCE:

A. Substitutions:
The manufacturers and catalog numbers listed hereinafter are intended to establish a standard of quality. Items specified as “owners standard” shall be provided as listed they have been requested by the Owner/Architect to match existing for continuity and/or future performance, maintenance standards or there is no equal product. Certain products have been selected for their unique characteristics and particular project suitability. Requests for substitutions will require architects approval and must be made in writing ten (10) days prior to bid date. If proposing a substitute, submit that product data and specified item product data indicate basis for substitution and any savings. Provide sample if requested. Substitution item will be reviewed and if approved it will be listed in an addendum prior to bid date.

B. Supplier Qualification:
The hardware supplier must be engaged currently in the furnishing, delivery and servicing of contract builders hardware. The firm shall have been furnishing hardware on similar projects in the vicinity for not less than two (2) years. The supplier must employ a certified Architectural Hardware Consultant (AHC) or a person with equivalent qualifications to be available at reasonable times during the course of this project for consultation with the owner, architect and general contractor.

C. Single source responsibility:
Obtain each type of hardware (latches and locks, hinges, closer, etc) from a single manufacturer

D. Fire-Rated Openings:
Provide door hardware for fire-rated openings that complies with NFPA and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Warnock Hersey, Factory Mutual, or other testing and inspecting organization for given type/size and degree of label. Provide proper latching hardware, door closers, approved bearing hinges and seals whether listed in the hardware schedule or not. All hardware shall comply with standards UBC702 (1997) and UL10C. These must be acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and frame labels.

1. Where emergency exit devices are required on fire rated doors, (with supplementary marking on door’ UL labels indicating “Fire Doors to be equipped with Fire Exit Hardware”) provide UL label on exit devices indicating, “Fire Exit Hardware”.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Marking and packaging:
All items of hardware shall be delivered to the job site, in the manufacturer’s original packages, they shall be marked to correspond with approved hardware schedule, item number, heading number, door number and key sets symbols. Include installation instructions with each piece of hardware.

B. Delivery:
The hardware supplier shall coordinate delivery with general contractor, in order to compile a mutually beneficial delivery schedule, which imposes no hardship on either party. Some items of the hardware may be delivered to fabricators for factory installation in such case, the general contractor shall be advised of such shipments, along with copies of shipping tickets and any other documentation, thus transferring responsibility to the manufacturer or fabricator, for care of said hardware. Any delivery fees will be in the quoted price of the material.

C. Storage:
   Hardware is to be delivered to the job site and stored in a clean dry, secure area, with adequate strong shelving. If requested by the contractor, the hardware supplier shall send a representative to the job site to “assist” the check in and laying-out of the hardware on the shelves. A representative of the contractor MUST be present. At this time any installation tips or special instructions will be reviewed.

D. No direct shipments will be allowed unless prior approval by the contractor.

1.06 WARRANTY:

A. Starting date for all warranty periods will be from the date of substantial completion.

B. All material must carry a limited warranty against defects in workmanship and materials from the date of acceptance of the project as follows.
   1. Door Closers: at least ten (30) year warranty, except electronic closers, two (2) years
   2. Exit Devices: at least three (3) year warranty, except electrified devices, one (1) year.
   4. Balance of the hardware: one (1) year.

C. Products judged to be defective during the warranty period will be replaced or repaired in accordance with the manufacturers warranty at no additional cost to the owner. However, NO warranty against defects due to improper installation or failure to exercise normal maintenance.

1.07 MAINTENANCE:

A. Maintenance service:
   If there are any products listed hereinafter that normally require a maintenance or service contract, provide the owner with details and costs of said contract.

B. Maintenance Tools and Instructions:
   Furnish a complete set of specialized tools and maintenance instructions as needed for the owners continued adjustment, maintenance, and removal and the replacement of door hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. The following manufacturers have been selected for this project, whose products numbers have been used in the preparation for this specification.
B. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

D. Where the exact types of hardware specified are not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having as nearly as possible the same operation and quality as the type specified, subject to Architect's approval.

2.02 MATERIALS:

A. Screws and Fasteners:
Provide all screws and fasteners of the proper size and type to properly anchor or attach the item of hardware they are intended for. Provide all fasteners with Phillips head, do not use through-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely.

B. Hinges:
The following is a guide for hinge type required for this specification:

1. 1-3/4" thick doors up to and including 3'0" wide:
2. Exterior: standard (.134) or heavy weight (.180) ball bearing, bronze/stainless steel 4-1/2" high.
3. Interior: standard (.134) or heavy weight (.180) plain or ball bearing, steel 4-1/2" high.
4. Furnish one pair of hinges for all doors up to 60" high. Furnish one additional hinge for every additional 30" or fraction thereof. The width of hinges shall be sufficient to clear all trim.
5. Hinges specified Ives (IVE), approved acceptable substitute Hager, Stanley.

C. Automatic and Manual Flush Bolts:
Shall have forged bronze faceplate with extruded brass lever and with wrought brass guide and strike. Flush bolts for hollow metal doors shall be extension rod type door up to 7'6" in height shall have 12" steel or brass rods, manual flush bolts for doors over 7'6" in height shall be increased by 6" for each additional 6" of door height. Wood doors shall have corner-wrap type. Provide dust proof strikes for all bottom bolts.

1. Flush Bolts specified Ives (IVE), approved acceptable substitute Hager, Rockwood.

D. Coordinators:
Where pairs of doors are equipped with automatic flush bolts, provide bar type coordinating device, surface applied to the underside of the stop at the frame head. Provide a filler bar of the correct length to span the entire width of the opening, and any appropriate brackets for parallel arm door closers, surface vertical rod strikes, and or any other hardware. Finish of the coordinator, filler bar and mounting brackets to be US28 unless otherwise noted.

1. Coordinators specified Ives (IVE), approved acceptable substitute Hager, Rockwood.

E. Mortise Locks:
1. Locks shall be ANSI A156.13, Grade 1 mortise locksets, Manufactured from heavy
gauge steel, containing components of steel with a zinc dichromate plating for corrosion
resistance.
2. Locks to have a standard 2-3/4” backset with a full 3/4” throw stainless steel mechanical
anti-friction latch bolt. Deadbolt shall be a full 1” throw, constructed of stainless steel.
3. Lever trim shall be cast or forged in the design specified, with 2-1/8” diameter roses.
Levers to be thru-bolted to assure proper alignment. Trim shall be applied by threaded
bushing “no exposed screws”.
4. Locks meeting this specification: Schlage (SCH) L9000 x 07A, approved acceptable
substitute Corbin Russwin ML2000, Stanley 45H

F. Cylindrical Locks:

1. Locks shall be ANSI A156.2, Series 4000 Grade 1 UL Listed for 3-hour doors.
   Manufactured from heavy gauge cold rolled steel mechanisms that are corrosion
   treated for normal conditions.
2. Locks to have standard 2-3/4” backset with a full 1/2” reversible dead latch. Thru-bolted
   mounting post for positive interlock to the door with concealed mounting screws.
3. Lever trim shall be pressure cast zinc to match finishes. The design specified, with 3-
   7/16” diameter roses. Trim shall be applied by “no exposed screws”.
4. Locks meeting this specification: Schlage (SCH) “ND” x Athens, approved acceptable
   substitute Corbin Russwin CL3300, Stanley 9K

G. Exit Devices:

1. Exit devices shall be touch pad type, fabricated of brass, bronze, stainless steel, or
   aluminum, plated to the standard architectural finishes o match the balance of the door
   hardware.
2. Exit devices shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA
   certified laboratory. A written certification showing successful completion of a minimum
   1,000,000 cycles must be provided.
3. All exit devices shall incorporate a fluid damper or other device, which eliminates noise
   associated with the standard operation. Touch pad shall extend a minimum of one half
   of the door width. End-cap will have three-point attachment to the door. Touch pad shall
   match exit device finish, and shall be stainless steel for US26, US26D, US28, US32,
   and US32D finishes. Only compression springs will be used in devices, latches, and
   outside trim and/or controls.
4. All lever design shall match mortise or cylindrical lock lever designs.
5. All devices to incorporate a security dead-latching feature.
6. Provide roller strikes for all rim and surface mounted vertical rod devices, ASA strikes
   for mortise devices, and manufacturers standard strikes for concealed vertical rod
   devices.
7. Device mechanism case and bar shall sit flush on the face of all flush doors, or spacers
   shall be furnished to fill gaps behind devices. Where glass trim or the moulding projects
   off the face of the door, provide glass bead kits.
8. Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated
   openings shall be UL labeled fire exit hardware.
9. Provide electrical options as scheduled.
10. Exit devices meeting this specification: Von Duprin (VON) 98/99 or 33/35 series No
    Substitution.

H. Door Closers:

1. All closers will utilize a stable fluid withstanding temperature range of 120 degrees f to
   –30 degrees f without seasonal adjustment of closer speed to properly close the door.
   Closers on fire rated doors will be provided with temperature stabilizing fluid that
complies with standard UL 10C for “Positive Pressure Fire Tests of Door Assemblies” and UBC 7-2 (1997).

2. Door closers shall hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1 1/2" in diameter, and double heat-treated pinion shall be 11/16" in diameter. A written certificate showing successful completion of a minimum or 10,000,000 cycles for exterior door closers must be provided.

3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and back check.

4. All closer shall have forged steel main arms and forged forearms for parallel arm closers.

5. Closer cylinders and arms (and metal covers when specified) shall have a power coating finish which has been certified to exceed 100 hours of slat spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification. For metal components that can’t be power coated, a special rust inhibiting finish (SRI) must be used.

6. All closers will not be seen on the public side or hallway side of the door. The appropriate drop plate or mounting plates will be used as conditions dictate.

7. Door closers meeting this specification: LCN (LCN) 4040XP MC, approved acceptable substitute Corbin Russwin CL8200 MC, Sargent 281 MC

I. Push Plates:

   1. Push plates shall be 4" wide x 16" high x .050" thick.
   2. Plates specified Ives (IVE), approved acceptable substitute Hager, Rockwood

J. Door Pulls and Push Bars:

   1. Pulls shall be 1" diameter solid bar stock, 12” center to center.
   2. Push bars shall be 1” diameter solid bar stock, of sufficient length to span from center to center of each stile.
   3. Pulls specified Ives (IVE), approved acceptable substitute Hager, Rockwood

K. Protective Plates:  

   Provide Kick, mop, and/or armor plates of .050 material with four beveled edges on the push side of all doors that have an automatic closing device and that have through traffic. Where scheduled, supply protective plates on the pull side of the door. Edge guards may be required supply as scheduled. Protection plates must be sized appropriately not to conflict with any cut outs, louvers, or other hardware. Furnish with machine or wood screws, the finish to match plates. Sizes of plates as follows:

   1. Kick Plates: 8" high x 2" less door width (LDW) on single doors, 1” LDW on pairs on doors.
   2. Mop Plates: 4” high x 1” LDW single and pairs of doors.
   3. Armor Plates: 36” high x 2” less door width (LDW) on single doors, 1” LDW on pairs on doors.
   4. Size of plates on the pull side of the doors 1” LDW
   5. Plates specified Ives (IVE), approved acceptable substitute Hager, Rockwood

L. Door Stops and Holders:

   It shall be the responsibility or the hardware supplier to provide doorstops for all doors in accordance with following requirements:

   1. Wall stops may be used wherever possible.
   2. Where wall stops cannot be used, provide dome type floor stops of the proper height.
3. At any opening where a wall or floor stop cannot be used, a heavy-duty overhead stop will be required.
4. At no time will a hinge pin stop be acceptable.
5. Stops specified Ives (IVE), approved acceptable substitute Hager, Rockwood

M. Overhead Stops/Holders:
   Furnish as specified. Overhead stops/holders specified Glynn-Johnson (GLY), approved acceptable substitute Rixson, ABH.

N. Thresholds and Gasketing:
   Furnish as specified and per details. Match finish of other items as closely as possible. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available. Threshold, sweep and weather-stripping will be supplied to weather proof the exterior doors. The thresholds will be supplied to fit the particular sill conditions and not conflict with the American Disabilities Act (ADA). Exterior pairs of doors will have split astragal to prevent air infiltration. Interior doors may require gasketing, thresholds and sweeps to act as a sound barrier per the owner’s request.

1. Thresholds specified National Guard Products (NGP), approved acceptable substitute Pemko, Hager.

2.03 FINISHES:
All hardware is to be furnished in one of the following finishes, depending upon the item and it’s base metal. All satin chrome or satin stainless steel or as noted.

<table>
<thead>
<tr>
<th>Item</th>
<th>BHMA #</th>
<th>US #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinges exterior</td>
<td>630</td>
<td>(US32D)</td>
</tr>
<tr>
<td>Hinges interior</td>
<td>652</td>
<td>(US26D)</td>
</tr>
<tr>
<td>Flush Bolts</td>
<td>626</td>
<td>(US26D)</td>
</tr>
<tr>
<td>Coordinators</td>
<td>628</td>
<td>(US28)</td>
</tr>
<tr>
<td>Mounting Brackets</td>
<td>628</td>
<td>(US28)</td>
</tr>
<tr>
<td>Locks</td>
<td>626</td>
<td>(US26D)</td>
</tr>
<tr>
<td>Exit Devices</td>
<td>626</td>
<td>(US26D)</td>
</tr>
<tr>
<td>Door Closers</td>
<td>689</td>
<td>(alum painted)</td>
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<tr>
<td>Plates</td>
<td>630</td>
<td>(US32D)</td>
</tr>
<tr>
<td>Door wall stops</td>
<td>626</td>
<td>(US26D)</td>
</tr>
<tr>
<td>Door floor stops</td>
<td>626</td>
<td>(US26D)</td>
</tr>
<tr>
<td>Overhead Holders</td>
<td>630</td>
<td>(US32D)</td>
</tr>
</tbody>
</table>

Other items to be 630 if available. If not, 626 over brass or bronze.

2.04 KEYING:
A. All locksets shall be furnished with three (2) cut keys. All cylinders shall be factory masterkeyed and grand masterkeyed as required. Locks shall be construction masterkeyed. Furnish ten (10) construction masterkeys to the general contractor. Furnish six (6) masterkeys for each masterkeyed group. The masterkeys shall be sent direct to the owner’s representative by registered mail, return receipt requested.
B. Consult with architect and/or owners representative and secure written approval of the complete keying layout prior to placing lock order with factory.

1. Cylinders and Keying specified Schlage (SCH), approved acceptable substitute

2.05 KEY CONTROL:

A. Key Cabinet:

   A key control cabinet shall be furnished provide a standard metal cabinet hinged-panel type for wall mounting, with capacity of 150% of the number of locks required on the project. Provide a key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers. Set up the key cabinet with all change keys tagged and indexed with a cross-index system. The cabinet shall be delivered to the owner’s representative prior to building occupancy. Installation and hanging of keys on hooks shall be by the owner. Instruct owner’s representative in the use of the key control system.

1. Key Cabinet specified Lund (LUN), approved acceptable substitute Key Control Systems, Telkee

PART 3 - EXECUTION

3.01 EXAMINATION:

Prior to installation of hardware, examine condition of opening size, shall be verified as to door frames being plumb and of correct tolerance, walls or any related items that would prevent proper installation of doors and hardware. Correct any and all defects prior to proceeding with installation.

3.02 INSTALLATION:

A. Prior to hardware installation the general contractor will set up a preinstall job site meeting with the hardware supplier, hardware installer and any other trades people deemed necessary (i.e. electrical contractor, security contractor, etc.) for communication to assure trouble free installation. This meeting would be best coordinated with the delivery requirements detained in section 1.05.

B. Review with the architect the mounting locations of various items of hardware in accordance with the Door and Hardware Institute’s (DHI), “Recommended Locations for Architectural Hardware” for standard and custom steel doors and frames, and DHI’s WDHS-3 for flush wood doors. Special attention to be given to all special and unusual conditions. All hardware shall be installed by carpenter mechanics skilled in the application of said hardware.

C. Install each hardware item in compliance with the manufacturers instructions and recommendations, using only the fasteners provided by the manufacturer.

D. Set thresholds for exterior doors in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 “Joint-Sealers”.
3.03 **FIELD QUALITY CONTROL:**

After all hardware has been installed, provide the services of a qualified hardware consultant to check for proper installation of hardware, according to the “Approved” hardware and keying schedule’s. Also, check the operation and adjustment of all hardware items in accordance with the manufacturer’s recommendations.

3.04 **ADJUSTING AND CLEANING:**

At final completion, hardware shall be left clean and free from disfigurement. Make final adjustment to all door closers and other items of hardware. Where hardware is found defective, repair or replace or otherwise correct as directed. After building is occupied, arrange an appointment with owner’s representative to instruct in the proper use, servicing, adjusting and maintenance of the hardware.

3.05 **PROTECTION:**

Provide protection for all items of hardware during construction, to prevent damage, field painting or marring. Damaged or disfigured hardware shall be replaced or corrected by the responsible party.

3.06 **HARDWARE SCHEDULE:**

A. Provide hardware for each door to comply with requirements of this section “Finish Hardware” hardware set numbers indicated in the door schedule, and in the following schedule of hardware sets.

B. It is intended that the following schedule includes all items of the finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the preamble will be the deciding document.

C. Hardware Sets:

**Hardware Group No. 01**

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Hardware Group No. 03

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Hardware Group No. 09

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CARD READER FURNISHED ELSEWHERE
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CARD READER FURNISHED ELSEWHERE

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CARD READER FURNISHED ELSEWHERE

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Card read retract latches doors can be opened. Free egress at all times.

American Electric Power
Corpus Christi Service Center
DOOR HARDWARE

08 87 10 - 13
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Hardware Group No. 18

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Hardware Group No. 19

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Hardware Group No. 34
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END OF SECTION
PART 1 GENERAL

1.01 SCOPE

A. Work Included: Provide glass and glazing for all exterior and interior openings as indicated on the drawings and specified herein. Work also includes the following:

1. Unframed mirrors.
2. Impact resistant glass.

B. Work Not Included: Glass and glazing not provided under this Section are as follows:

1. Framed Mirrors: Section 10 28 13.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

1.03 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thicknesses indicated or specified are minimums and are for detailing purposes only. Confirm glass thickness by analyzing project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet, as a minimum, the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E1300, according to the following requirements:
   b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical under wind action.
      1) Load Duration: 60 seconds or less.
   c. Probability of Breakage for Sloped Glazing: 1 lite per 1000 lites set more than 15 degrees off vertical and under wind and snow action.
      1) Load Duration: 30 days.
d. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1”, whichever is less.
   1) For monolithic lites, heat treated to resist wind loads.
   2) For insulating glass.
   3) For laminated glass lites.

e. Minimum Glass Thickness for Exterior Lites: ¼”.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120° F, ambient; 180° F, material surfaces.

1.04 REFERENCED STANDARDS

A. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

5. IGMA: Insulated Glass Manufacturers Alliance.

B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations listed below, except where more stringent requirements are indicated herein.

2. Insulated Glass Manufacturers Alliance (IGMA)
   a. TM-3000 "Vertical Glazing Guidelines"

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this project.

B. Safety Glass Standards: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

C. Allowable Tolerances: Thicknesses of glass specified are nominal; provide glass manufactured to tolerances listed in GANA Manual.
1.05 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of glass, glazing sealants and accessories required.

1. Indicate structural, physical and environmental characteristics, size limitations, special handling requirements, etc.

B. Submit insulating glass manufacturer's certification indicating units meet or exceed specified requirements.

C. Submit laminated glass manufacturer's certification indicating units meet or exceed specified requirements.

D. Shop Drawings: Required data for shop drawings on glazing may be incorporated with shop drawings for framing members. Show thicknesses of glass; proposed "bites" in frames, sizes and locations of blocks, clips, beads, stops edge treatments; note quality, type and strength of each lite.

E. Samples: Submit and obtain approval of samples before proceeding with glass fabrication. Minimum two 12" x 12" samples of each glass type required, except clear monolithic glass. Submit color samples of exposed sealants and/or gaskets.

F. Special Environmental Requirements': Submit the following in accordance with Section 01 81 13):

1. Product Data: For Sealant and Adhesives, documentation indicating VOC Content

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle glazing materials in accordance with manufacturer's recommendations to prevent damage and deterioration.

B. Various items to receive glazing as specified elsewhere may be factory-glazed or site-glazed at Contractor's option.

C. Deliver glazing compounds and sealants in manufacturer's unopened labeled containers.

D. Deliver glass with manufacturer's labels intact. Do not remove labels until glass has been installed.

1.07 PROJECT CONDITIONS

A. Field verify measurements and conditions of installations.

B. Examine all details. Provide proper fitting for details indicated.
C. Do not perform work under adverse weather or job site conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range recommendations by manufacturer.

D. Protect work from damage during and after installation until project acceptance.

1.08 WARRANTY

A. Mirror: Submit manufacturer's ten (10) year warranty against silver spoilage. A replacement will be provided for mirrors that develop visible defects. Defective units shall be replaced at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers and Fabricators: Specifications herein are based on glass and materials manufactured or fabricated by the following companies. Not all firms listed manufacture or fabricate all the items specified herein. However, to ensure consistent quality of appearance and performance, provide each type or kind of glass or material from a single source. Manufacturers for specialty products are listed within the specification to establish a particular type, color, pattern, etc. Equal products by the manufacturers listed are acceptable providing they meet the type, color, pattern, etc. as approved by the Architect.

1. Manufacturers
   a. AGC FLOAT GLASS NORTH AMERICA
   b. PPG
   c. GUARDIAN INDUSTRIES

2. Fabricators
   a. VIRACON
   b. OLDCASTLE BUILDINGENVELOPE
   c. ARCH ALUMINUM & GLASS LLC
   d. TRULITE GLASS AND ALUMINUM

2.02 PRIMARY FLOAT GLASS

A. Conformance: Type I, Class 1 for clear glass, Class 2-tinted heat-absorbing and light-reducing; Class 3 for tinted, light-reducing glass, Quality q^3, conforming to ASTM C1036.

B. Thickness: 1/4”, unless otherwise indicated.

C. Color: Clear.

2.03 HEAT TREATED FLOAT GLASS

A. Conformance: Condition A, Kind FT, Type I, Class 1 for clear glass, Class 2-tinted heat-absorbing and light-reducing; Class 3 for tinted, light-reducing glass, conforming to ASTM C1048.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2. Roll Wave Maximum Distortion Tolerance: 0.003 inch target with 0.005 inch maximum peak to valley measurement.


B. Thickness: 1/4", unless otherwise indicated.

C. Color: Clear.

D. Locations: Safety glazing locations as designated and required by applicable code(s).

2.04 WIRE GLASS

A. Wire Glass: USE PROHIBITED.

2.05 MISCELLANEOUS GLASS TYPES

A. Unframed Mirror

1. Description: Clear float glass conforming with ASTM C1036, Type 1, Class 1, Quality q², with full silver coating, copper coating and protective back coating.

2. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

3. Thickness: 1/4".

4. Size: As indicated on schedule.

5. Adhesive: Type as recommended by mirror manufacturer produced specifically for setting mirrors by spot application on all types of substrates encountered. PALMER PRODUCTS CORPORATION "Mirro-Mastic", SOVEREIGN SPECIALTY CHEMICAL “Nail Power Mirror Mastic, ROYAL ADHESIVES & SEALANTS “Gunther Pro”.

2.06 GLAZING MATERIALS AND ACCESSORIES

A. Glazing Sealants and Compounds

1. General: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the current VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, AND all sealants used as fillers must meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.

2. Comply with manufacturer's recommendations for selection of hardness. Select materials and variations or modifications for compatibility with surfaces contacted in the installation.
3. Exterior Glazing: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   a. Glazing Sealant: One-part neutral-curing silicone glazing sealant, ASTM C 920 Class A, Type S, Grade NS, Class 100/50, Use NT; for high movement joints at metal-to metal and glass to metal.
      1) Dow Corning Corporation; 790
      2) GE Advanced Materials - Silicones; SilPruf LM SCS2700
      3) Pecora Corporation; 890
      4) Tremco Incorporated; Spectrem 1
   b. Glazing Sealant: One-part neutral-curing silicone glazing sealant, ASTM C 920, Type S, Grade NS, Class 50, Use NT; for general applications in glazing installation subject to high movement including perimeter; use non-staining formula at absorbent perimeter applications.
      1) DOW CORNING CORPORATION; 795 or 756 SMS
      2) GE ADVANCED MATERIALS - SILICONES; SilPruf NB SCS9000 or SilPruf SCS2000
      3) PECORA CORPORATION; 864
      4) TREMCO INCORPORATED; Spectrem 2
   c. Glazing Sealant: One-part neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT; for general applications in glazing installation including perimeter; use non-staining formula at absorbent perimeter applications.
      1) DOW CORNING CORPORATION; 791
      2) GE ADVANCED MATERIALS - SILICONES; UltraGlaze SSG4000 or UltraGlaze SSG4000AC
      3) TREMCO INCORPORATED; Proglaze SSG or Tremsil 600
   d. Structural Glazing Sealant: ASTM C1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in glazing assembly indicated.
      1) DOW CORNING CORPORATION; 995.
      2) GE ADVANCED MATERIALS - SILICONES; UltraGlaze SSG4000.
      3) PECORA CORPORATION; 896.
      4) TREMCO INCORPORATED; Proglaze SG.

3. Interior Glazing: Compound of polymerized butyl rubber and inert fillers, with or without polyisobutylene modification, solvent based, 95% solids, formed and coiled on release paper, tack-free in 24 hours, paintable, non-staining.

B. Miscellaneous Glazing Materials
1. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Neoprene or EPDM, 80-90 durometer hardness, with proven compatibility with sealants used.
3. Spacers: EPDM, 40-50 durometer hardness with proven compatibility with sealants used.
4. Compressible Filler (Rod): Closed cell or waterproof jacketed rod stock of synthetic rubber or plastic form, compatible space with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

2.12 FABRICATION

A. General: Fabricate glass and other glazing products in sizes required to glaze openings indicated, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

B. Glass Cutting: Cut glass to accurate sizes and shapes as indicated on drawings. Allow edge clearances and tolerances in accordance with GANA recommendations.
   1. Edges: Provide factory-cutting and factory-formed edges for all butt-glazed, heat tempered and insulating glass. Provide ground edges for all drilled holes, notches and other fabrication or finishing techniques.

C. Heat Strengthened and Tempered Glass
   1. Heat Strengthened: Heat treated to strengthen glass in bending to not less than 2.0 times annealed strength for the strengthened glass.
   2. Tempered: Heat treated to strengthen glass in bending to not less than 4 to 5 times annealed glass strength for the strengthened glass.
   3. Cut glass to required size before tempering. Comply with Glass Tempering Association recommendations.
   4. Provide tongless tempered glass. When size limitations require tong edges, support each piece during tempering process so that tong marks will be concealed in the glazed system.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, substructure and installation conditions. Do not proceed with glazing work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.
3.02 PROTECTION AND PREPARATION

A. Protect glass from edge damage during handling and installation. Remove and legally dispose damaged glass off of the project site. Damaged glass is defined as glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and/or appearance.

B. Do not cut, seam, nip or abrade tempered glass.

C. Inspect each piece of glass immediately before installation and eliminate any which have observable edge damage or face imperfections.

D. Unify appearance of each series of lights by setting each piece to match other pieces, as nearly as possible. Inspect each piece and set with pattern, draw, and bow oriented in same direction as other pieces.

E. Clean glazing channels and other framing members to receive glass immediately before glazing. Remove loose coatings. Apply primer to joint surfaces receiving sealants when recommended by sealant manufacturer.

3.03 INSTALLATION - GENERAL

A. Comply with combined recommendations and technical reports of manufacturer's of glass and glazing materials used with GANA "Glazing Manual", except when more stringent requirements are indicated.

B. Install insulating units to comply with recommendations by IGMA, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

C. Glazing channel dimensions shown are intended to provide for necessary bite on glass, minimum edge clearance and adequate sealant thickness, with reasonable tolerance. Adjust as required by job conditions at time of installation.

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

E. Install primers, sealants, tapes, and gaskets in accordance with manufacturer's recommendations. Set glass without springing and install securely to prevent rattling or breakage.

F. Where wedge-shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs, or by proved adhesives, including embedment of gasket tail in cured heal bead.

1. Miter cut and bond gasket ends together at corners where gaskets will not pull away from corners and result in voids or leaks in the glazing system.
3.04  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 edge-to-edge, but not necessarily in one continuous length. Do not stretch tapes to make them fit openings.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these 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 just before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.05  GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance 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. Center glass lites in openings on setting blocks and press firmly against soft compression gaskets 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. Install gaskets so they protrude past face of glazing stops.

3.06  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 sealant to provide a substantial wash away from glass.

3.07 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation by attachment of streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass. Remove non-permanent labels and clean surfaces.

B. Maintain glass in a reasonable clean condition during construction so that it will not be damaged by corrosive action, and will not contribute (by wash off) to the deterioration of glazing materials and other work. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish on both faces not more than four days before acceptance of the work. Comply with glass manufacturer's recommendations for final cleaning.

3.08 GLAZING SCHEDULE

A. Insulating Impact Resistant Glass: 1-11/32" insulating glass unit consisting of 1/4" heat strengthened or tempered as required with 0.034 low emissivity coating on surface #2, 1/2" air space with aluminum spacer and 1/4" heat strengthened / 0.090 PVB interlayer / 1/4" heat strengthened.

1. Glass/Color
   a. Interior Pane: Clear; laminated; 19/32" thick
   b. Air Space: ½”.
   c. Exterior Pane: Green; VIRACON Low E VE 2-2M #2; ¼" thick.

2. Reflectance

3. Transmittance
   a. Ultraviolet %: <1.
   b. Visible %: 58.
   c. Solar %: 22.

4. Shading Coefficient: 0.35.

5. Solar Factor (SHGC): 0.31.

END OF SECTION
**SECTION 08 91 19**

**FIXED LOUVERS**

**PART 1  GENERAL**

1.01  SCOPE

A. Provide wall louvers as indicated. All louvers on exterior of building to be provided under this Section.

1.02  RELATED SECTIONS

A. Sealant: Section 07 92 00.

1.03  QUALITY ASSURANCE

A. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

2.  SMACNA: Sheet Metal and Air Conditioning Contractors National Association.

B. Performance Requirements: Provide units whose performance ratings have been determined in compliance with AMCA Standard 500 and 511.

C. Water Penetration and Free Area: Meet AMCA Standard for louvers specified.

D. Wind Load: Design louvers and supports for 20 pounds per square foot wind load.

E. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

F. Field Measurements: Verify size, location and placement of louver units prior to fabrication wherever possible.

G. Shop Assembly: Coordinate field measurements with fabrication and shop assembly.

H. Factory painted finish to be performed by an applicator specifically approved by paint manufacturer. The applicator shall provide written notification of approval by paint manufacturer prior to application of the finish.
1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s specifications; certified test data, where applicable; and installation instructions for required products, including finishes.

B. Shop Drawings: Submit plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.

C. Samples: Submit three samples, 6" square, of each required aluminum fluoropolymer finish. Prepare samples on metal of same gage and alloy to be used in the work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by the metal producer to provide the required finish.

B. Aluminum Extrusions: ASTM B 221. Alloy 6063-T52.

C. Fasteners: Stainless Steel, 300 series.

D. Anchors and Inserts: Use non-ferrous metal anchors and inserts for exterior installation.

E. Bituminous Paint: Acid and alkali resistant solvent type black bituminous mastic.

2.02 FABRICATION, GENERAL

A. Provide louvers and accessories of design, materials, sizes, depth, arrangement and metal thicknesses indicated, or if not indicated, as required for optimum performance with respect to airflow; water penetration; strength; durability and uniform appearance as suited to applications shown and intended use.

B. Fabricate frames including integral sills to suit adjacent construction with adequate tolerances for installation including application of sealant in joints between louvers and adjoining work, where applicable.

C. Include supports, anchorages and accessories required to achieve a complete assembly, properly installed.

D. Provide sill extensions and loose sills made of same material as louvers, where indicated or required, for drainage to exterior and to prevent water penetrating to interior.
E. Join frame members to one another and to stationary louver blades by field bolted connections made necessary by size of louvers. Maintain equal blade spacing including separation between blades and frames at head and sill to produce a uniform appearance.

2.03 STATIONARY EXTRUDED ALUMINUM WALL LOUVERS

A. Horizontal Blade Louvers: Size and depth indicated, with blades of profile, slope and spacing indicated, or if not indicated, to meet performance requirements.

1. Extrusion Thickness: Not less than .081" for blades and frames.
2. Furnish units complying with following performance requirements.  
   a. Free Area: Not less than 45%.
   b. Water Penetration: Not more than 0.01 oz. per square foot of free area at an minimum intake airflow of 1000 fpm free area velocity.

B. Manufacturer and Type: Provide louver vane profile to match AIROLITE K6774 manufactured by AIROLITE; AIRLINE; ARROW; CONSTRUCTION SPECIALTIES; INDUSTRIAL LOUVERS; AMERICAN WARMING AND VENTALATING; RUSKIN; RELIABLE or PENN AIRSTREAM.

2.04 LOUVER SCREENS

A. Provide screens for exterior louvers.

B. Fabricate screen frames of the same metal and finish as the louver units to which secured, unless otherwise indicated.

C. Provide frames consisting of U-shaped metal for permanently securing screen mesh.

D. Size: 1/2" sq. mesh, 0.063" anodized aluminum wire.

E. Locate screens on inside face of louvers. Secure screens to louver frames with machine screws, spaced at each corner and at 12" o.c. between.

2.05 BLANK-OFF PANELS

A. Blank-Off Panels: Laminated panels consisting of rigid extruded polystyrene or polyurethane insulation core and .032 aluminum facing sheets.

1. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
2. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
3. Finish: Provide with baked-on black enamel flat finish.
2.06 METAL FINISHES

A. Aluminum Finishes: Fluoropolymer finish containing not less than 70% PVDF (Kynar 500) resins; "Trinar" by AKZO; "Duranar" by PPG; "Fluropon" by VALSPAR. Total dry film thickness not less than 1.0 mils, or coatings meet or exceed the requirements of AAMA 2605.

1. Color: As selected by Architect from paint manufacturer's complete specified line.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for the installation of anchorages which are to be embedded in concrete or masonry construction. Coordinate the delivery of such items to the project site.

3.03 INSTALLATION

A. Locate and place louver units plumb, level and in proper alignment with adjacent work.

B. Use concealed anchorages wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealant and joint fillers as indicated.

D. Repair damaged finishes. Restore finishes so that there is no evidence of corrective work. Return items which cannot be refinished in the field to the shop, make the required alterations, and refinish the entire unit, or provide new units, as directed by Architect.

E. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry or dissimilar metals.
F. Provide concealed gaskets and flashing and install as the work progresses to make the installations weathertight.

G. Refer to Section 07 92 00 for sealant in connection with installation of louvers.

3.04 CLEANING

A. Clean louver surfaces in accordance with manufacturer's instructions. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces in accordance with manufacturer's instructions.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION
SECTION 09 21 16

GYPSUM BOARD SYSTEMS

PART 1  GENERAL

1.01  SCOPE

A. Provide gypsum board systems consisting of wall board and framing as indicated and specified. Work includes:

1. Gypsum board wall systems.
2. Suspended gypsum board ceilings and soffits including suspension framing system.
3. Fire-rated gypsum board construction where indicated.
4. Edge trim, corner beads, control joints, accent reveals, fasteners, joint treatment materials and other accessories required for a complete installation.
5. Includes installation of acoustical insulation specified in Section 07 21 00.
6. Installation of metal access doors.

1.02  RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.
B. Tile Backer Board: Section 09 30 00.
C. Acoustical Insulation: Section 07 21 00.
E. Sealant: Section 07 92 00.
F. Firestopping: Section 07 84 00.
G. Wood Blocking: Section 06 10 50.

1.03  QUALITY ASSURANCE


B. Metal Framing System: Comply with ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

C. Reference Standards: Wherever the following abbreviations are used herein they shall refer to the corresponding standard:

2. GA: Gypsum Association.
D. Fire-Rated Construction: Comply with fire resistance ratings indicated on drawings and as required by governing authorities and codes. Provide materials, accessories and application procedures that have been listed by Underwriters Laboratories or tested in accordance with ASTM E119 for the type of construction shown.

E. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

F. Guarantee: Submit written guarantee stating that cracks, delaminations or other imperfections in the drywall work which may develop within a period of 2 years from date of acceptance will be repaired at no cost to the Owner.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each gypsum board system component.

B. Submit for LEED Credit documentation.
   1. Refer to Section 01 8113 “Sustainable Design Requirements” for additional LEED submittal requirements.
   2. Product Data for Credit MRc4: For products having recycled content, provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating material costs for each product having recycled content.
   3. Product data for Credit MRc5: For products having regional content:
      a. Provide documentation indicating location of manufacturer of product. If only a fraction of the material is manufactured regionally, indicate fraction as a percentage product’s total weight.
      b. Provide documentation indicating location of extraction, harvest or recovery of raw material in product. If only a fraction of the material is extracted, harvested or recovered regionally, indicated fraction as a percentage of product’s total weight.
      c. Include statement indicating material costs for each product having regional content.
   4. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building’s weatherproofing system.

C. Submit manufacturer's certification that fire-rated assemblies proposed meet project requirements, including evidence of approved test reports acceptable to governing building code enforcing authorities, that assemblies when installed with proposed materials, will meet or exceed fire ratings required.

1.05 DELIVERY, STORAGE AND HANDLING
A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration. Protect cold-formed metal framing from corrosion, deformation and other damage during delivery, storage and handing per requirements of AISI's “Code of Standard Practice”.

C. Protect adjoining surfaces against damage and soiling.

1.06 JOB CONDITIONS

A. Coordinate installation sequencing with work of other trades.

1. Verify completion of other work, including that of other trades, which will be concealed by gypsum drywall construction before installation of wallboard.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Gypsum Board: U.S. GYPSUM CO.; CERTAINTEED CORP.; GEORGIA-PACIFIC CORP.; NATIONAL GYPSUM COMPANY; CONTINENTAL BUILDING PRODUCTS.

B. Studs, Framing and Furring: CLARK DIETRICH BUILDING SYSTEMS; MARINO/WARE; STATE BUILDING PRODUCTS; gypsum board manufacturers listed above.

C. Others as listed for specific products.

2.02 STEEL STUDS

A. General: Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25% percent.

B. Type: Screw type "C" shape, roll formed sheet steel members conforming to requirements of ASTM C745 and C645.


2. Gage and Width – 3-5/8" to 6" Studs
   a. 25 gage x 3-5/8": Up to and including 14'-6" high.
   b. 20 gage x 3-5/8" 1) Over 14'-6" up to and including 16'-5" high
2) At wall mounted cabinet locations
3) At walls receiving ceramic tile
c. 20 gage x 4": Over 16'-5" up to and including 17'-6" high
d. 20 gage x 6": Over 17'-6" up to and including 24'-0".
e. 16 gage at door jambs, heavy equipment locations, and interior partitions receiving masonry veneer.
f. Provide other gages or widths as indicated on drawings or as required by span conditions.

3. Flange Width: Nominal 1-1/4".

C. Runners and Tracks: Designed and sized to receive studs. Gage to match studs except deflection tracks.

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; 20 gage thickness and in width to accommodate depth of studs. Provide one of the following:
   a. #53 FlexTrack, 20 gage typical, by SUPERIOR METAL TRIM PRODUCTS
   b. 20 gage top track with 2" minimum legs and 20 gage Spazzer 9200 Stud Spacer Bar by CLARK DIETRICH BUILDING SYSTEMS
   c. Slip Track (Slp Trk) by BRADY CONSTRUCTION INOVATIONS
   d. The System by METAL-LITE
   e. The Three Legged Dog by FLEX-ABILITY CONCEPTS.
   f. A double slip track, 20 gage, can be used in lieu of the proprietary deflection tracks specified above. Legs of tracks shall be minimum 2".

2. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; 20 gage thickness and in width to accommodate depth of studs. Provide one of the following:
   a. Fire Trak System by FIRE TRAK CORPORATION.
   b. Flame Safe FlowTrak System by GRACE CONSTRUCTION PRODUCTS.
   c. The system by METAL-LITE INC.

D. Backing Plates (Blocking): Steel sheet for blocking; width to fit framing spacing; height to be 6" unless otherwise indicated.

1. Base Metal Thickness: Minimum 0.0598".

2.03 CEILING/SOFFIT SUSPENSION SYSTEM

A. General: Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25% percent.

B. Provide the following materials unless otherwise indicated on the drawings. Metals used in areas subjected to moisture to be hot-dipped galvanized in accordance with ASTM A653 G40.
1. Main Runners: Cold-rolled steel channels; not less than 16 gage; G90 galvanized finish for moist areas, black asphaltum painted for other areas. Spacing as required, but not to exceed 48" o.c.
   a. 1-1/2" deep where structural support framing is at 48" o.c. or less.
   b. 2" deep where structural support framing is over 48" and less than 66" o.c.
2. Cross Furring
   a. Cold-rolled steel channels, not less than 16-gage; 3/4" size; same finish as main runners.
   c. 2-1/2" x 20-gage, G40 galvanized steel studs. Provide for multiple layer applications. Provide 12" long nested studs at suspension points.
   a. Tie Wire: Minimum 16-gage.

C. Optional Framing: At contractor's option, proprietary furring system may be used in lieu of black iron system for dry interior conditions.

1. Description: Direct hung system consisting of interlocking main beams and cross-furring members and hanger wires, designed and manufactured specifically for suspending gypsum board ceiling.
   a. ASTM C645.
   b. Electrogalvanized, cold-rolled steel, 0.020" thick.
   c. Double web members; 1-1/2" high with 1-3/8" capped face.
2. Manufacturer: 640 System by CHICAGO METALLIC CORP.; Drywall Suspension System by USG, WORTHINGTON STEEL COMPANY, Watercheck CONTINENTAL BUILDING PRODUCTS, Furring Systems/Drywall by ARMSTRONG.

2.04 METAL FURRING

A. General: Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25% percent.

B. Material

1. Steel Sheet Components: Comply with ASTM C645 requirements for metal, unless otherwise indicated.
2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A653, G40, hot-dip galvanized, unless otherwise indicated.

C. Rigid Furring Channels: Hat-shaped; minimum 0.0312 inch uncoated metal thickness; 7/8" deep, unless otherwise indicated.
D. Resilient Furring Channels: Minimum 0.0188 inch uncoated metal thickness; ½" deep; asymmetrical or hat-shaped members designed to reduce sound transmission.

2.05 GYPSUM BOARD

A. General: Comply with ASTM C1396.

1. Recycled Content of gypsum board: For those products manufactured with byproduct gypsum, provide products with average recycled content of such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25% percent.

B. Fire Rated Gypsum Wallboard: Type "C" or "X" (special fire retardant) to meet fire ratings for construction shown. Tapered edges. Thickness 5/8" unless otherwise indicated. Use at all locations indicated as meeting a specific fire resistance rating.

1. Provide 5/8", Type X board at all locations not indicated to receive a specific type board.

C. Moisture and Mold Resistant Gypsum Wallboard

1. ASTM C1396 (Section 5), Type X.
2. Edges: Tapered.
3. Thickness: 5/8”, unless otherwise indicated.
4. Acceptable products: Mold Tough and Mold Tough Firecode (Type X) by USG; XP and XP Fire-Shield by NATIONAL; ToughRock and ToughRock Type X by GEORGIA-PACIFIC; Mold Defense and Mold Defense Type X by CONTINENTAL BUILDING PRODUCTS or equal by other gypsum board manufacturers listed in 2.01A.
5. Water Absorption: ASTM C473, the average water absorption for panels is not greater than 5 percent by weight after two-hour immersion.

2.06 ACCESSORIES

A. Fasteners: Drywall screws and metal framing screws per manufacturer's instructions and recommendations for type and size, based on construction and conditions involved.

1. Steel Drill Screws: ASTM C1002.

B. Trim: ASTM C1047.

1. Manufacturers
   a. Metal: BEADEX MANUFACTURING; CLARK DIETRICH BUILDING SYSTEMS; listed gypsum board manufacturers
   b. Vinyl: VINYL TECH; VINYL CORP.; TRIM TEX
2. Corner Beads - Outside, Square Corners: 1-1/4 inch x 1-1/4 inch heavy gauge galvanized steel or vinyl, perforated.

3. Corner Beads - Outside, Non-square Corners: BEADEX B-1 Splay Flexible Corner or equal. Concealed metal; two galvanized continuous strips laminated with paper trim; for application without mechanical fasteners.

4. Exposed Edges (Casing Beads): L-bead or LC-bead; exposed long flange receives joint compound. Size to suit wallboard. J-shaped bead that does not receive joint compound is not permitted.

5. Expansion (Control) Joints: Tape protected 1/4" wide x nominal 7/16" deep control slot.

C. Joint Treatment Materials: ASTM C475.

1. Joint Tape. Width to adequately cover joint.

2. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   a. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      1) Use setting-type compound for installing paper-faced metal trim accessories.
   c. Fill Coat: For second coat, use setting-type, sandable topping compound.
   d. Finish Coat: For third coat, use setting-type, sandable topping compound.
   e. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

3. Joint Compound for Tile Backing Panels:
   a. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
   b. Cementitious Backer Units: Section 09 30 00.

D. Additional Item: All additional accessories to complete work including nails and anchors to secure frames to walls and floors.

G. Acoustic Materials

1. Insulation: See Section 07 21 00.
   a. Type: Semi-rigid mineral fiber (glass fiber, slag wool or rock wool) blankets. Conform to ASTM C665, Type I, unfaced.
   b. Thickness: 3 inch, unless otherwise indicated.
   c. Manufacturer: Thermafiber by U.S. GYPSUM; JOHNS MANVILLE; OWENS-CORNING FIBERGLAS; CERTAINTEED.

2. Sealant: Nonsag, paintable, nonstaining latex sealant complying with ASTM C834.
Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

a. Manufacturers
   1) USG Acoustical Sealant
   2) TREMCO Acoustical Sealant
   3) PECORA BA-98

b. 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. Neoprene impregnated sealant tape.
4. Head of Wall Insulation: Pre-manufactured, high-density mineral fiber acoustical insulation shaped to fit the trapezoidal flutes, typical of metal decking and complying with ASTM E119 as safing insulation.

PART 3 EXECUTION

3.01 PREPARATION
A. Provide adequate lighting and ventilation during installation and joint finishing treatment.

3.02 INSPECTION
A. Examine substrates and installation conditions. Do not proceed with gypsum wallboard work until unsatisfactory conditions have been corrected.

1. Protrusions of framing, twisted framing members, or unaligned members must be repaired before installation of wallboard is started.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.03 FRAMING INSTALLATION
A. Comply with the requirements of ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

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

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Rated Stud Deflection Assembly: Install in accordance with manufacturer's instructions to provide required fire ratings. Ensure that anchoring devices, back-up material, clip supports and other materials are as used in referenced fire tests.
3. Securely attach runner to floor with expansion anchors or other approved means.

C. Install all framing plumb and square with spacing as indicated.

D. Provide supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Company’s “Gypsum Construction Handbook”.

E. Bridging
1. Up to 10 ft. Wall Height: 1 row.
2. 10 ft. and Over Wall Height: 2 rows of bridging.

F. Provide a minimum of two (2) screws per connection.

3.04 FURRING INSTALLATION

A. Wall Application
1. Attach to masonry with expansion anchors or at mortar joints with concrete nails or expansion anchors.
2. Spacing shall be 16 in. o.c., unless otherwise indicated.
3. Run vertically or horizontally for maximum efficiency.

B. Ceiling Application: Install suspension system for ceilings and soffits, in accordance with manufacturer's instructions, recommendations and as follows:
1. Locate furring runners at 48" on center with hanger wires at 48" on center. Attach hanger wires to structural framing members specifically for this purpose. Attach hanger wires to framing wires using attachment devices whose suitability has been demonstrated by standard construction practice or by certified test data.
2. Connect furring runners with furring tees spaced at 24" on center. Locate additional tees or hanger support as required for surface mounted and recessed ceiling and soffit items such as light fixtures, diffusers, etc. Add additional hanger wires as required to support all such items at each corner.
3. Provide wall track wherever suspension meets a vertical surface.
4. Do not support ceiling system from ductwork, electrical conduit, heating or plumbing lines, and vice versa. Each utility system and the ceiling system shall be a separate installation and each shall be independently supported from the building structure.
If an interference occurs, provide trapeze type hangers or other suitable supports for each system. Locate hangers where they will not interfere with access to mixing boxes, fire dampers, valves and other appurtenances requiring servicing.

b. 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.

3.05 GYPSUM BOARD INSTALLATION

A. Gypsum Board Systems: Comply with ASTM C840.

B. General

1. Pre-installation Conference: Before start of gypsum board installation, meet at the project site with the Architect and installers of related work, including work requiring openings, chases, frames, access panels, support, similar integrated requirements and mechanical and electrical trades. Review potential interferences and conflicts and coordinate layout and sequencing requirements for proper installation and integration of the work.

   a. Do not proceed with gypsum board installation until blocking, framing, bracing and other supports for subsequently applied work have been installed, reviewed and accepted by the Architect.

   b. Do not install gypsum board until work concealed by gypsum board has been installed.

C. Application

1. Install gypsum board face side out. Do not install imperfect, damaged or damp boards.

2. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.

3. Locate either edges or end joints over supports. Position boards so that both tapered edge joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

4. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.

5. Floating Construction: Install gypsum board with "floating" internal corner construction, unless isolation of the intersecting board is indicated.

6. In addition to compliance with the standards, comply with specific requirements indicated for each type of arrangement of gypsum wallboard system shown. Space fasteners in accordance with manufacturer's recommendations and complying with referenced standards.

   a. Walls and Partitions: Apply sheets horizontally or vertically. Provide maximum sheet lengths to minimize end joints with edges or ends over supports. In two layer applications, stagger joints of second layer from joints of first layer.
b. Cut and install panels to eliminate vertical joints in corners of door frames to ceiling.
c. Make cutouts to fit within wall plate, register and grille flanged. All cutouts made by knife or saw.
d. Make angles and corners clean, true, plumb and square; walls plumb, flat and straight and ceilings flat and level.
e. Ceilings: Apply gypsum board on ceilings, before application on walls and partitions. Install in direction and manner to minimize end joints. Stagger end joints over supports. In two layer applications, stagger joints of second layer from joints of first layer.

D. Direct-Glue Application

1. Apply gypsum vertically with closely butted joints within 10 minutes after application of mastic adhesive, sooner if recommended by manufacturer of adhesive. Apply firm hand pressure over entire board to effect a bond and to level board. Use slight sliding movement to position board. Shim drywall 1/4" off floor.
2. Apply mastic adhesive in amounts and at locations on board as recommended by adhesive manufacturer. Provide temporary fasteners or bracing as recommended until adhesive sets.

3.06 INSTALLATION OF SOUND RATED PARTITIONS

A. Provide sound-rated construction where indicated.

B. Acoustic Insulation: Install single layer of acoustic batt insulation in designated partitions after one side of gypsum board is installed, filling width and height of partition completely. Attach to gypsum board with adhesive spots to prevent subsequent displacement.

C. Extend partition stud system through acoustical ceilings to substrate. Apply gypsum board base panels full height, both sides of partition.

D. 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 C919 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.

E. Seal partition perimeters. Provide continuous beads of acoustical sealant at juncture of both faces of runners or plates with floor and ceiling construction and wherever work abuts dissimilar materials. Seal prior to installation of sound attenuation insulation and gypsum board panels.

F. Provide continuous beads of sealant at juncture of gypsum board and abutting surface. Install gypsum board with 1/8" relief for sealant. Sealants to be contained within depth of gypsum board, not as a fillet.
G. At openings and cutouts, fill open spaces between edges of gypsum board and fixtures, cabinets, ducts, and other flush or penetrating items, with continuous bead of acoustical sealant.

H. If sound-rated partitions intersect non-sound-rated partitions, extend sound construction to completely close-off sound flanking paths through non-rated construction. Seal joints between face layers at vertical interior angles of intersecting partitions.

I. Exercise particular care at walls surrounding toilet areas and walls and ceilings surrounding mechanical spaces to provide properly constructed sound-rated gypsum board partition and ceiling systems.

J. Verify that electrical boxes are not located back-to-back; back-to-back boxes to be offset at least one stud space. Do not close off non-complying conditions before notifying and receiving direction from Architect.

3.07 TRIM AND ACCESSORIES

A. Install corner beads at external corners of gypsum wallboard and sheathing work. Use longest practical lengths.

B. Install edge trim wherever edge of gypsum board or sheathing would be exposed or semi-exposed.
   1. Provide beaded trim to receive joint compound at all gypsum wallboard work.
   2. Provide L-type trim where work is abutted to other work and Kerf-type where work is kerfed to receive kerf leg.
   3. Provide U-type trim where edge is exposed, revealed, gasketed or sealant filled, including expansion joints.

C. Attach to framing with steel drill screws. Clinch attachment to wallboard not acceptable.

D. Control Joints
   1. Install control joints to isolate gypsum board surfaces as recommended by ASTM C840. Verify locations with Architect prior to installation. Generally locate joints as follows when:
      a. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling.
      b. Ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration.
      c. Construction changes within the plane of the partition or ceiling.
      d. Partition or furring run exceeds 30’.
      e. Ceiling dimensions exceed 50’ in either direction with perimeter relief; 30’ without relief.
      f. Wings of "L", "U", and "T"-shaped ceiling areas are joined.
      g. Expansion or control joints occur in the base exterior wall.
h. Partition terminations at window mullions.
   1) Neoprene joint tape and caulking installed under Section 07 92 00.
   2) Aluminum mullion closures provided under Section 08 41 13.

2. Provide framing immediately on both sides of joint and back with 2"+/- gypsum board strips as required to maintain fire resistance rating.

3.09 FINISHING

A. Comply with manufacturer's instructions for mixing, handling and application of materials. Apply treatment at joints both directions, at flanges of trim accessories, penetrations of gypsum board (electrical boxes, piping and similar work), fastener heads, surface defects and elsewhere indicated. Apply in manner that will result in each of these items being concealed when applied decoration has been completed.

B. Prefill open joints of more than 1/16" with special chemical-hardening type bedding compound, before bedding joint tape.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Do not use topping compound for bedding joint tape.

E. Apply joint compound for the final coat of joint treatment, unless specifically recommended by the manufacturer for that use.

F. Walls Above Acoustical Ceiling Systems: Tape and fill joints with two coats of joint compound, sanding not required.

G. Leave all exposed surfaces smooth and even, ready for painting.

H. Provide where indicated on the drawings levels of finish as specified in ASTM C840, "Recommended Specification on Levels of Gypsum Board Finish". Levels of finish consist of:

1. Level 1 - **Areas Above Ceilings:** All joints and interior angles shall have tape embedded in joint compound. Provide surface free of excess joint compound. Tool marks and ridges are acceptable.

2. Level 2 – **As a Substrate for Ceramic Tile:** All joints and interior angles to have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

3. Level 4 – **All Areas Not Indicated to Receive Levels 1 or 2:** All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories.
All joint compound shall be smooth and free of tool marks and ridges.

3.09 ADJUST AND CLEAN

A. Remove any screw which does not engage into a framing member or spins freely.

B. When paper face is punctured, drive new screw approximately 1-1/2" from defective fastener and remove defective fastener. Fill damaged surface with compound.

C. Ridging
   1. Do not repair ridging until condition has fully developed: approximately 6 months after installation or one heating season.
   2. Sand ridges to reinforcing tape without cutting through tape.
   3. Fill concave areas on both sides of ridge with topping compound.
   4. After fill is dry, blend in topping compound over repaired area.

D. Fill cracks with compound and finish smooth and flush.

E. 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.

3.10 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.

END OF SECTION
PART 1  GENERAL

1.01  WORK INCLUDED
A. Extent of tile work is shown on drawings and schedules, and as specified herein.
B. Types of tile work required including the following:
   1. Ceramic wall tile, floor tile and base.
   2. Backer board.
C. Section also includes:
   2. Metal edge/transition strips installed as part of tile installations.

1.02  RELATED SECTIONS
A. Sustainable Design Requirements: Section 01 81 13.
B. Sealant: Section 07 92 00.
C. Concrete slab preparation: Section 01 73 00.

1.03  QUALITY ASSURANCE
A. Manufacturer: Provide tile of each type produced by a single manufacturer. Provide materials obtained from one source for each type and color of tile, grout, and setting materials.
B. Installer: A firm with not less than 5 years experience in installing tile in applications similar to those required for this work.
C. Ceramic Tile Manufacturing Standard: TCA 137.1. Furnish tile complying with Standard Grade requirements unless indicated otherwise.
D. Proprietary Materials: Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.
E. Installer to verify locations of all flexible joints required by the provisions of this section, by the recommendations of TCA, and by the recommendations of the related manufacturers. See Article 3.06.
1. Joint locations may or may not be indicated on the drawings.

1.04 PERFORMANCE REQUIREMENTS

A. Dynamic Coefficient of Friction: For tile installed on walkway surfaces subject to traffic while wet, provide products with a dynamic coefficient of friction not less than 0.42 as determined by testing identical products per ANSI A137.1.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required. Include certifications and other data to show compliance with these specifications.

B. Special Environmental Requirements: Submit the following in accordance with Section 01 81 13:

1. Product Data: For adhesives and epoxy, documentation indicating VOC Content

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: Submit manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors available, for each type of tile specified. Include samples of grout and accessories requiring color selection. Submit full size sample for each type of trim, accessory and color. Submit samples of metal edge strip.

E. Certification: Furnish Master Grade Certificate for each type of tile, signed by manufacturer and Installer.

1.06 PRODUCT HANDLING

A. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's instructions.

1.07 JOB CONDITIONS

A. Maintain environmental conditions and protect work during and after installation in accordance with referenced standards and manufacturer's printed recommendations.

PART 2 PRODUCTS

2.01 CERAMIC TILE

A. Wall Tile, Floor Tile and Base: ANSI 137.1. Provide trim pieces as required.
1. Basis of Design: Manufacturer, Styles and Colors: As indicated on the drawings.
2. Other Acceptable Manufacturers: Tile manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the sizes and colors are an acceptable match as approved by the Architect prior to bid opening. These additionally approved manufacturers will be included by Addendum. An unacceptable pattern or color match is reason for disapproval of product and manufacturer. No substitutions will be considered after bid opening.

2.02 MORTAR, GROUT AND ACCESSORIES

A. See Tile Installation Systems in Part 3 of this Section. Setting mortar and grout to be from same manufacturer.

B. General - All Adhesives, Grouts and Epoxies: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits effective July 1, 2005 and rule amendment date of January 7, 2005.

C. Modified Dry Set Cement Mortar - Thin Set: Factory mixed mortar of Portland cement/sand, field gauged with undiluted latex admixture. Conform to ANSI A118.4, Latex-Portland Cement Mortar. Provide type suitable for “medium-set” for tiles with a dimension larger than 15”.

1. Provide one of the following:
   a. BOSTIK, Durabond D-50 or D-60.
   b. MAPEI, Ultraflex 3.
   d. LATICRETE, 255 MultiMax.

D. Grout - Ceramic Tile (ANSI A118.7): Integrally colored, sanded (unless otherwise indicated), polymer modified cement type, factory prepared (premixed) grout. Color as selected by Architect.

1. Provide one of the following:
   a. BOSTIC, Ceramic Tile Grout with BOSTIK 425 Acrylic-Latex Admixture.
   b. TEC (H.B. FULLER), TEC Power Grout.
   c. MAPEI, Ultracolor.
   d. LATICRETE, Permacolor Grout.

2. Colors: As selected by Architect.
3. Provide unsanded grout for glass tile and tile joints less than 1/8” wide.


1. Products: Provide one of the following:
F. Metal Edge Trim: L-shape, height to match tile and setting-bed thickness; stainless steel, ASTM A666, 300 Series. SCHLUTER, CERAMIC TOOL COMPANY, BLANKE

G. Grout Sealer: Low VOC, penetrating type as recommended by grout manufacturer that does not change color or appearance of grout.

2.06 TILE BACKER BOARD

A. Description: Nominal 1/2” thick cementitious board with fiberglass mesh reinforcements conforming to the requirements of ANSI A118.9.

1. Provide cadmium plated screws, type as recommended by board manufacturer.
2. Joint Treatment Tape: 2” wide, 10x10 glass mesh type or similar type as recommended by board manufacturer.

B. Manufacturer: Wonder Board by MODULARS, INC.; Util-A-Crete by FIN PAN; Durock Interior Tile Backer Board by U.S. GYPSUM; Dens-Shield by GEORGIA PACIFIC.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine surfaces to receive tile, setting beds and accessories before tile installation for the following:

1. Defects or conditions adversely affecting quality and execution of the installation.
2. Deviations beyond allowable tolerances of surfaces to receive tile.
3. Do not proceed with installation work until unsatisfactory conditions are corrected.

B. Conditions of surfaces to receive tile.

1. Surfaces to be firm, dry, clean, and free of oily or waxy films or curing compounds.
2. Grounds, anchors, plugs, hangers, bucks, electrical, plumbing and HVAC work in or behind tile to be installed prior to proceeding with tile work.

3.02 PREPARATION

A. Prepare surfaces to receive tile as required to achieve proper bond and as recommended by the Tile Council of America.
1. See Section 01 73 00 for additional floor preparation requirements.

B. Fill cracks, low areas and pits in concrete with self-leveling fill of type recommended by tile manufacturer for substrate conditions encountered.

C. Lightly grind concrete subfloors with a terrazzo grinder to remove trowel marks, slab curl at saw cut joints or other surface irregularities or high spots which will telegraph to the flooring surface.

D. Sawcut or grind transition areas to install tile flush with adjacent finished floor materials.

E. Clean surfaces in a manner suitable for proper installation. Verify that slabs are free of curing membranes, oil, grease, wax, dust and other materials deleterious to tile installation.

F. Primers or other preparations required or recommended in accordance with manufacturer's instructions.

3.03 TILE BACKERBOARD

A. Location: Provide tile backerboard on metal stud walls as a substrate for ceramic tile products specified herein which are located where indicated.

B. Install in strict accordance with manufacturer's recommendations and ANSI A108.11, Interior Installation of Cementitious Backer Units.

1. Butt ends and edges of adjacent panels.
2. Attach with screws spaced at 6 inch centers on perimeter and field.
   a. Maintain minimum 1/2 inch from screws to panel edge.
   b. At wainscot or similar location where tile terminates in same plane of wall, shim tile backerboard flush with adjacent wall board. Provide shims continuous along face of studs.
3. Locate control and expansion joints in same locations as substrate and where required by wall tile.
4. Apply glass mesh tape, or type recommended by board manufacturer, over joints. Embed tape in setting material indicated for specified tile finish.

3.04 INTERIOR WALL TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2015 Edition; and as follows:

B. Thin Set - Stud Walls - Over Tile Backerboard: TCA W244.

1. Tile: ANSI A108.5.
3. Backerboard
a. Joint Preparation: Fill joints completely with setting mortar and embed 2 inch wide coated fiberglass tape into skim coat of same mortar.

b. Apply setting mortar in one layer, troweling skim coat with trowel's flat edge and then texturing with appropriate notched trowel. Troweling equipment must be appropriate for type of tile work and in good condition.

   1. Tile: ANSI A108.5.

   1. Tile: ANSI A108.5.

3.05 INTERIOR FLOOR TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2015 Edition; and as follows:

B. Thin Set: TCA design F113.
   1. Tile: ANSI A108.5.

3.06 TILE INSTALLATION - PROCEDURES

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
   a. Floors in wet areas
   b. Kitchen areas
   3. Floor tiles 8" x 8" and larger
   d. Rib-backed floor tiles

B. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. 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 that plates, collars or covers overlap tile.

D. Placement Methods: Install tile using the hereinbefore specified setting beds and grouts.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.

1. Avoid tile layout with less than half width tiles at room/area perimeters, unless otherwise indicated on the floor layout drawings. Notify Construction Manager if layout not achievable per layout indicated on the drawings. Do not continue in room/area in question until approved by the Associate.

2. Provide uniform joint widths.


3.07 FLEXIBLE JOINTS

A. Locate flexible joints (expansion, control and isolation joints) prior to tile installation. See Quality Assurance in Part 1 herein.

B. Provide flexible joints as specified herein, unless more stringent requirements are indicated on drawings. Provide as specified, regardless if not indicated on drawings.

C. Joint to be continuous from face of tile to bottom of setting bed or leveling bed. Reinforcing to be discontinued at joint. Install continuous joint filler material in joint from setting or leveling bed to a point below face of tile adequate for proper placement of backing rod and sealant.

D. Joint Design: TCA design EJ171 as applicable. See Section 07 92 00 for sealant. Provide at the following locations:

1. Horizontal Surfaces
   a. Directly over expansion joints.
   b. Over anti-fracture membrane which is applied over structural slab cold joints, construction joints and control joints.
   b. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
2. Vertical Surfaces
   a. Directly over joints in wall substrate including cold joints, construction joints, control joints and expansion joints.
   b. At changes in substrate material.
   c. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
   d. Where indicated.

E. Curing: Cure tile floor, base, and wall installations in accordance with manufacturer's recommendations, TCA recommendations, and in accordance with ANSI requirements.

F. Metal Edge Strips: Provide metal edge strips at openings without thresholds, and where exposed edges of tile floors meet other materials.

1. Except as otherwise indicated, where trim is located across door openings, locate trim on the door side in line with the edge of the door stop, terminating at the rabbet.

3.07 REPAIR, CLEAN AND PROTECT

A. Repair, or remove and replace chipped, damaged or otherwise defective work to the satisfaction of the Architect.

B. Cleaning: Upon completion of placement and grouting, clean all tile surfaces so that they are free of foreign matter.

1. Use methods and materials as recommended by tile manufacturer.
2. Replace tiles that cannot be satisfactorily cleaned.

C. Grout Sealer: Apply silicone grout sealer to grout joints according to grout sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer from joints and from tile faces by wiping with soft cloth.

D. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent damage and wear.

1. Prohibit foot and wheel traffic from using tiled floors for at least 3 days after grouting is completed.
2. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION
PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide acoustical lay-in panel ceiling system as shown and specified.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

1.03 QUALITY ASSURANCE

A. Workmanship: Comply with Ceilings & Interior Systems Contractors Association (CISCA) “Ceiling Systems Handbook”.

B. Installation: Performed by an experienced authorized installer approved by acoustical material manufacturer.

C. Fire Hazard Classification: Provide acoustical materials which have been UL tested, listed and labeled Class 0-25, when tested in accordance with ASTM E84, Class A flame spread rating in accordance with ASTM E1264 requirements.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standards.


E. Coordination Between Trades: Quality assurance includes the cooperation with HVAC, Plumbing and Electrical Contractors in regards to ceiling grid layout.

1.04 SUBMITTALS

A. Product Data

1. Submit manufacturer's product data and installation instructions for each type of acoustical material and suspension system required.
2. Submit manufacturer's written instructions for recommended maintenance practices for each type of acoustical ceiling system required. Include recommendations for cleaning and refinishing acoustical units and precautions against materials and methods that may be detrimental to finishes and acoustical performances.
B. Samples: Submit 12" square acoustical panel samples for each type of acoustical unit required. Provide 12" long suspension system and edge molding samples.

C. Certification: Submit manufacturer’s certification of acoustical units fire hazard classification rating and performance requirements.

D. Submit for LEED Credit documentation.

1. Refer to Section 01 8113 “Sustainable Design Requirements” for additional LEED submittal requirements.

2. Product Data for Credit MRC4: For products having recycled content, provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating material costs for each product having recycled content.

3. Product data for Credit MRC5: For products having regional content:
   a. Provide documentation indicating location of manufacturer of product. If only a fraction of the material is manufactured regionally, indicate fraction as a percentage product’s total weight.
   b. Provide documentation indicating location of extraction, harvest or recovery of raw material in product. If only a fraction of the material is extracted, harvested or recovered regionally, indicated fraction as a percentage of product’s total weight.
   c. Include statement indicating material costs for each product having regional content.

4. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building’s weatherproofing system.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened protective packaging, with manufacturer’s labels indicating brand name, pattern size, thickness and fire rating as applicable, legible and intact.

B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.

C. Store cartons open at each end to stabilize moisture content and temperature.

D. Do not begin installation until sufficient materials to complete a room are received.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel 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.
1.07 EXTRA MATERIALS

A. Maintenance Stock: Under this Section furnish to the Owner prior to final acceptance, extra maintenance stock of acoustical materials, consisting of a minimum of one percent of area of each size, type, thickness installed on the job, and 4% if the area is under 5,000 sq. ft. This extra stock is for the Owner's use after completion of the Project and is not to be used for repair or replacement required during the construction period. Properly package, seal, and identify extra stock material.

PART 2 PRODUCTS

2.01 SUSPENSION SYSTEM

A. Description: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint.

1. Description: Cold-rolled electrogalvanized steel, factory applied white finish paint to match ceiling tile.
2. Manufacturer/Model
   a. 15/16" exposed face; DONN (USG INTERIORS) Model DX; ROCKFON Chicago Metallic 200 Snap Grid System; ARMSTRONG Prelude.
   b. Other Manufacturers: Subject to requirements, suspension systems manufactured by DONN (USG INTERIORS) or ROCKFON are acceptable.
3. Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1, Direct Hung unless otherwise indicated.
4. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.
5. Edge Moldings: Hemmed edge wall angles, cold-rolled electrogalvanized steel, factory applied finish to match grid system.
6. Recycled Content: Minimum 5 percent post-consumer recycled content, or minimum 20 percent pre-consumer recycled content at contractor's option.

2.02 ACOUSTICAL UNITS

A. Acceptable Manufacturers: The following models listed are by ARMSTRONG. Subject to requirements, products by CERTAINTEED or U.S. GYPSUM are acceptable.

B. Type A1: ARMSTRONG Cortega Second Look II, #2758.

1. Surface Texture: Medium
2. Composition: Mineral Fiber
3.  Color: White
4.  Size:  24” x 48”
5.  Edge Profile:  Angled Tegular 15/16” grid.
6.  Noise Reduction Coefficient (NRC):  ASTM C 423; 0.55
7.  Ceiling Attenuation Class (CAC):  ASTM C 1414; 40
8.  Flame Spread:  ASTM E 1264; Fire Resistive
9.  Light Reflectance (LR) White Panel:  ASTM E 1477; 0.82
10. Recycle Content: Post-Consumer - 1% Pre-Consumer - 54%

C.  Type A2:  ARMSTRONG Ceramaguard Fine Fissured – Perforated, #608.
1.  Surface Texture:  Medium
2.  Composition:  Mineral Fiber
3.  Color: White
4.  Size:  24” x 48”
5.  Edge Profile:  Square Lay-In 15/16” grid.
6.  Noise Reduction Coefficient (NRC):  ASTM C 423; 0.55
7.  Ceiling Attenuation Class (CAC):  ASTM C 1414; 40
8.  Flame Spread:  ASTM E 1264; Fire Resistive
9.  Light Reflectance (LR) White Panel:  ASTM E 1477; 0.82
10. Dimensional Stability: HumiGuard Max
11. Recycle Content: Post-Consumer - 0% Pre-Consumer - 38%

PART 3  EXECUTION

3.01  INSPECTION

A.  Examine substrates, structure and installation conditions.  Do not proceed with acoustical ceiling systems work until unsatisfactory conditions have been corrected.

B.  Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02  PREPARATION

A.  Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling.

1.  Avoid use of less than half widths units at borders.

B.  Coordinate with ceiling layout on drawings.

C.  Notify Architect of discrepancies between ceiling layout on drawings and ceiling layout proposed.  Do not proceed until approved by Architect.
3.03 INSTALLATION

A. Suspension System: Comply with ASTM C636 requirements and be water or laser leveled, maximum deflection of 1/360 of span and maximum surface leveling tolerance 1/8" in 12'-0".

B. Rough Suspension

1. Hangers: Ceiling suspension systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines or any other utility lines. Each utility and the ceiling suspension system shall be a separate installation and each shall be independently supported from the building structure. Where interferences occur, employ trapeze hangers or supports to avoid interferences with appurtenances requiring servicing. Support all four corners of suspension systems at fluorescent light fixtures.

2. Wall Molding
   a. Provide edge trim molding at perimeter of acoustical ceiling installation and intermediate vertical surfaces. Use maximum lengths. Miter trim corners to provide tight, accurate joint. Connect moldings securely to substrate surfaces.
   b. Connect moldings to substrate at intervals not over 16" on center and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0".

C. Acoustical Units

1. Install acoustical lay-in panels level, in uniform plane, with joints accurately cut to ensure a snug and square fit. All panel faces and edges to be free from damage or soiling.
   a. Fit border units accurately at borders and penetrations.
   b. Recreate regular and decorative edges at wall cuts and other cuts.
   c. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and perimeter moldings.
   d. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   e. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.

2. Coordinate suspension systems grid layout with electrical lighting fixture lay-out and installation.

3.04 CLEANING

A. After installation, clean soiled or discolored surfaces of acoustical units and exposed suspension members. Comply with manufacturer's recommendations for cleaning and touch-up of minor finish damage.
B. Adjust all sags and twists which develop in ceiling systems. Remove and replace units which are improperly installed and damaged units which cannot be successfully cleaned and repaired to eliminate evidence of damage.

END OF SECTION
SECTION 09 65 00
RESILIENT FLOORING

PART 1  GENERAL

1.01  WORK INCLUDED
A. Provide resilient flooring as shown and specified. Work includes:
1. Composition (Bio Based) tile flooring.
2. Base.
3. Adhesives and accessories to complete the work.

1.02  RELATED SECTIONS
A. Sustainable Design Requirements: Section 01 81 13.

1.03  QUALITY ASSURANCE
A. Provide each type of resilient flooring and base material produced by one manufacturer, including recommended adhesives and leveling compounds.
B. Provide each type resilient flooring and base material from same production run. Colors shall be uniform throughout.
C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.
   2. FS: Federal Specifications as established by the U.S. Government, General Services Administration.
   4. ADA: Americans with Disabilities Act Accessibility Guidelines.

E. Slip Retardant Performance: Unless a greater performance is specified under a specific product, all floor materials must have a minimum static coefficient of friction of 0.6.

1.04  SUBMITTALS
A. Submit manufacturer's product data and installation instructions for each type of resilient flooring, base and accessory required.
B. Samples

1. Tiles: Submit full sized samples of each type, color and pattern required to illustrate the full range of color variations.
2. Base: Provide 6" lengths of each type and color.

C. Shop Drawings: Show locations of each type and color of tile and tile pattern.

D. Submit manufacturer's certification that resilient flooring furnished complies with required fire test performance and has been tested and meets indicated requirements.

E. Submit manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring, base and accessory material required.

F. Extra Stock: Furnish extra materials in the following quantities:

1. Tiles and Base: Furnish 2% of the total quantity (but not less than 2 full sealed cartons) of each type, pattern and color. Provide 5% of colors with less than 5000 square feet. Properly package and identify each material.

G. Submit for LEED Credit documentation.

1. Refer to Section 01 8113 “Sustainable Design Requirements” for additional LEED submittal requirements.
2. Product Data for Credit MRc4: For products having recycled content, provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating material costs for each product having recycled content.
3. Product data for Credit MRc5: For products having regional content:
   a. Provide documentation indicating location of manufacturer of product. If only a fraction of the material is manufactured regionally, indicate fraction as a percentage product’s total weight.
   b. Provide documentation indicating location of extraction, harvest or recovery of raw material in product. If only a fraction of the material is extracted, harvested or recovered regionally, indicated fraction as a percentage of product’s total weight.
   c. Include statement indicating material costs for each product having regional content.
4. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building’s weatherproofing system.
5. Product Data for Credit IEQ 4.3: Documentation from an independent testing agency indicating compliance with the FloorScore Standard.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.
B. Store, protect, and handle resilient flooring materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

C. Store materials in areas to receive resilient flooring for a minimum of 48 hours before installation.

1.06 PROJECT CONDITIONS

A. Maintain uniform room temperature range not less than 70 degrees F., in areas to receive resilient flooring for minimum 48 hours before installation and 48 hours after installation.

B. Provide adequate lighting and ventilation during installation and clean-up.

C. Protect adjoining surfaces from damage and soiling.

PART 2 PRODUCTS

2.01 RESILIENT FLOORING MATERIALS

A. Composition Tile: ASTM F2982, Standard Specification for Polyester Composition Floor Tile, 12" x 24" x 1/8".

1. Colors, Patterns and Manufacturers
   a. Basis of Design: Striations as manufactured by ARMSTRONG.
   b. Other Acceptable Manufacturers: Vinyl composition tile manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the sizes and colors are an acceptable match as approved by the Architect prior to bid opening. These additionally approved manufacturers will be included by Addendum. An unacceptable pattern or color match is reason for disapproval of product and manufacturer. No substitutions will be considered after bid opening.

2. Static Load – ASTM F970: 250 lbs/sq. in.

2.02 BASE

A. Rubber Base: Complying with ASTM F1861, Type TP, Group 1, 4" high, 1/8" gage. Provide long length rolls and job formed corners. Standard top set cove (Style B) at resilient and other hard surface flooring and straight toeless (Style A) at all carpeted floors.

1. Colors and Manufacturers
   a. Basis of Design: Colors and types indicated on the drawings are manufactured by JOHNSONITE.
b. Other Acceptable Manufacturers: Products manufactured by VINYL PLASTIC, INC. (VPI) or ROPPE are acceptable providing they meet the requirements specified herein and are an acceptable color match as approved by the Architect. Color match should be submitted to the Architect during bidding for inclusion by an Addendum.

2.04 ACCESSORIES

A. Leveling Compound: Non-staining latex modified, Portland cement based type, compatible with flooring, as provided or recommended by the flooring manufacturer.

B. Adhesives: Waterproof, stabilized type as recommended by the resilient flooring and base manufacturer to suit material and substrate conditions.

1. VOC Content: The volatile organic compound (VOC) content of adhesives shall not exceed the limits defined in Rule #1168 “Adhesive and Sealant Applications” of the South Coast Air Quality Management District (SCAQMD), of the State of California. All VOC limits are defined in grams per liter, less water and less exempt compounds (determined by U.S. EPA Reference Test Method 24). The VOC limits are as follows:
   a. Water-based contact cement: 250 g/L
   b. Water-based construction adhesive: 100 g/L

C. Resilient Edge/Transition Strips: Provide rubber or stainless steel transition strips by the following manufacturers.

   a. ROPPE, #56
   b. JOHNSONITE/TARKETT, CTA-XX-H
   c. VPI FLOORING, ACC12

2. Resilient-to-Concrete: Stainless steel
   a. SCHRULER Reno U; stainless steel
   b. GREAT LAKES TILE PRODUCTS; Reducer.
   c. BLANKE CORP.; Reducer Trim.

3. Where transition types are required for conditions other than those listed above, provide rubber type from the manufacturers listed to create a smooth transition or termination.

E. Cleaning and Polishing Materials: Polish and neutral cleaner as recommended by the floor material manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation condition. Do not proceed with resilient flooring work until unsatisfactory conditions have been corrected.
B. Subfloor surfaces shall be smooth, level, at the required finish elevation, and within
the tolerances specified in Section 03 30 00.

C. Installation constitutes acceptance of existing conditions and responsibility for
satisfactory performance.

3.02 PREPARATION

A. Prepare substrates according to floor manufacturer’s written instructions to
ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and
      hardeners.
   2. Remove substrate coatings and other substances that are incompatible
      with adhesives and that contain soap, wax, oil, or silicone, using
      mechanical methods recommended by floor tile manufacturer. Do not use
      solvents.
   3. Perform tests recommended by flooring manufacturer. Proceed with
      installation only after satisfying manufacturer’s recommendations for test
      results.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and
patching compound; remove bumps and ridges to produce a uniform and smooth
substrate.

D. Do not install flooring until it is the same temperature as the space where it is to
be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be
covered by flooring.

3.03 INSTALLATION

A. Install resilient flooring and accessories with adhesive in strict compliance with the
manufacturer’s recommendations. Butt tightly to vertical surfaces, thresholds,
nosings and edgings. Scribe around obstructions and to produce neat joints, laid
tight, even and straight. Extend flooring into toe spaces, door reveals and into
closets and similar openings.

B. Tile Flooring
   1. Lay tile flooring with joints tight, in true alignment and parallel to walls of
      rooms and corridors.
   2. Lay tile symmetrically about centerlines of space, without pattern or
      borders. Adjust layout to avoid use of cut widths less than one-half tile at
      room perimeter.
   3. Match tile for color by using manufactured and packaged sequence.
4. Broken, cracked, or deformed tiles are not acceptable.
5. Immediately after installation, thoroughly roll tile with a 150 lb. sectional roller until a firm, uniform bond has been obtained.

C. Base

1. Install at walls, column, casework and other permanent fixtures as scheduled. Install in as long of lengths as practicable. Tightly bond base to backing throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
2. Provide terminal base ends beveled and toes rounded.
3. On masonry surfaces or other similar irregular surface, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

D. Edge Strips: Place tightly butted to flooring and secure with adhesive. Install at edges of flooring which would otherwise be exposed.

3.04 CLEANING AND PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. After flooring has set, clean thoroughly. Remove excess adhesive or other surface blemishes from flooring, using neutral type cleaners as recommended by the flooring manufacturer.

C. Perform initial maintenance according to latest edition of manufacturer's maintenance manual.

D. Protect installed flooring from damage and staining with heavy duty non-staining Kraft paper or other covering at all traffic lanes. Protect completed work from traffic and damage until final acceptance.
SECTION 09 65 66
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 WORK INCLUDED
A. Provide rubber athletic flooring as indicated. Include all trim, accessories and adhesives for a complete installation.

1.02 RELATED SECTIONS
A. Sustainable Design Requirements: Section 01 81 13.

1.03 QUALITY ASSURANCE
A. Installer Qualifications
1. Firm experienced in the flooring field and approved by the flooring manufacturer.
2. Must have completed a minimum of three projects of similar magnitude and complexity.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.04 SUBMITTALS
A. Product Data: Submit manufacturer's product data that includes Physical Properties and installation instructions.

B. Color Selection Chart: Submit to Architect for selection. Submit actual sample of color material if so requested by Architect.

C. Samples
1. Tiles: Submit full sized samples of each type, color and pattern required to illustrate the full range of color variations.
2. Sheet Flooring: Manufacturer's standard sample size, but not less than 9” x 9” of each type, color and pattern required to illustrate the full range of color variations.

D. Maintenance Literature: Submit three copies of manufacturer's recommended maintenance instructions.
E. Extra Stock

1. Tiles: Furnish 2% of the total quantity (but not less than 2 full sealed cartons) of each type, pattern and color. Provide 5% of colors with less than 5000 square feet. Properly package and identify each material.

F. Special Environmental Requirements': Submit the following in accordance with Section 01 81 13):

1. Submit product documentation for Sealant and Adhesives, documentation indicating VOC Content

1.05 DELIVERY, STORAGE AND HANDLING

A. Do not deliver materials until masonry and painting work is completed and all overhead mechanical and electrical work is installed.

B. Maintain room temperatures at minimum 55 degrees F. in storage areas and during installation.

1.06 JOB CONDITIONS

A. Proper Surfaces

1. Even, sound, thoroughly clean and dry and free of all defects that might adversely affect the flooring work.

2. All floors to receive resilient flooring shall be wet cured only. No curing compound permitted.

B. Related Work: Work which passes through, beneath or behind flooring must be completed prior to starting any flooring work.

C. Temperature Requirements

1. Temporary Heat: Provide as required to maintain the minimum temperature during flooring installation and for at least one week after installation.

2. Minimum Temperature: 70°F for a minimum two weeks prior to and during application.

3. Humidity: Do not apply flooring when relative humidity exceeds 70% or to damp or wet surfaces.

D. Ventilation: Provide adequate ventilation to prevent accumulation of hazardous fumes during application of solvent-based products in enclosed spaces, and maintain until flooring and finish has cured.
PART 2 PRODUCTS

2.01 RUBBER FLOORING TILES

A. Manufacturer
1. Basis of Design: Ovation manufactured by MATC INC.
2. Other Manufacturers: Subject to requirements, products manufactured by other rubber sports flooring manufacturers are acceptable. Products should be submitted to the Architect during bidding for inclusion by an Addendum.

B. Tiles: Dual layer construction resilient rubber as follows:
1. Thickness: 3/8" (10mm)
2. Wear layer thickness: 2mm
3. Edges: Square
4. Tile Sizes: 39.37" x 39.37" Square (1m x 1m)
5. Recycled Content: 34% pre-consumer & 24.8% post-consumer
6. Colors: As indicated on the drawings.

C. Product Testing
1. Hardness - ASTM D2240 Shore A Durometer: Top: 82; Bottom: 70
2. Tensile Strength - ASTM D412: Top: 1,275 psi; Bottom: 450 psi
3. Taber Abrasion - ASTM C501 (H-22): 0.256 grams
4. Flammability (Critical Radiant Flux - ASTM 648): Class I
5. Compression Set Under Force - ASTM D395B: 19.4%
6. Static Load - ASTM F970-97: 500 psi
7. Smoke Density - ASTM E662: Pass
8. Coefficient of Friction - ASTM C1028: Wet: 0.84; Dry: 0.93
9. Elongation at Break - ASTM D412: 160%
10. Tear Resistance - ASTM D624: 148.5 lbs/inch

2.02 ACCESSORIES

A. Concrete Slab Prime: Non-staining type, compatible with adhesive, as recommended by flooring manufacturer.

B. Leveling Compound: Non-staining latex modified, Portland cement based type, compatible with flooring, as provided or recommended by the flooring manufacturer.

C. Adhesives: Waterproof, stabilized type as recommended by the resilient flooring and base manufacturer to suit material and substrate conditions.
1. Low-VOC, FS MMM-A-125C, Type II, water- and mold-resistant. Use ASTM D3110, dry-use type for laminated and finger-jointed members, certified in accordance with ASTM C557 and complying with required VOC regulations.
a. **VOC Content:** The volatile organic compound (VOC) content of adhesives shall not exceed the limits defined in Rule #1168 “Adhesive and Sealant Applications” of the South Coast Air Quality Management District (SCAQMD), of the State of California. All VOC limits are defined in grams per liter, less water and less exempt compounds (determined by U.S. EPA Reference Test Method 24). The VOC limits are as follows:

1) Water-based contact cement: 250 g/L  
2) Water-based construction adhesive: 100 g/L

**PART 3 EXECUTION**

3.01 INSPECTION

A. Examine substrates and installation condition. Do not proceed with flooring work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 SUBSTRATE PREPARATION

A. Prepare substrates according to floor manufacturer's written instructions to ensure adhesion of flooring products.

B. Concrete Substrates

1. Verify that substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Perform moisture and pH tests recommended by flooring manufacturer. Proceed with installation only after satisfying manufacturer's recommendations for test results.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install flooring until it is the same temperature as the space where it is to be installed.

E. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.
3.03 INSTALLATION

A. Install flooring in accordance with manufacturer's instructions and recommendations.

3.04 CLEANING AND PROTECTION

A. Protect resilient flooring from damage and wear during construction operations. Where temporary cover is required for this purpose, comply with manufacturer's recommendations for protective materials and the method of their application. Remove temporary covering just prior to cleaning for final inspection.

B. Clean flooring just prior to final inspections. Use materials and procedures recommended by flooring manufacturer.

END OF SECTION
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PART 1  GENERAL

1.01  WORK INCLUDED

A. Installation of Owner furnished carpet; provide all glue and accessories necessary for the installation.

B. Work includes preparation of subsurfaces, cleaning, and protection of finished carpet.

C. Carpet – Owner Furnished: Coordinate obtaining items from Owner through the Construction Manager. Contractor shall be responsible for carpet damaged or missing after being received from Construction Manager.

1.02  RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

1.03  QUALITY ASSURANCE

A. Installer: Firm with not less than 5 years of carpeting experience similar to work of this Section.

1. Work not in compliance with the manufacturer’s recommended standards and procedures shall be promptly corrected at the Contractor's expense.

B. General Standard: "Carpet Specifiers Handbook" by The Carpet and Rug Institute; for definitions of terminology not otherwise defined herein, and for general recommendations and information.

1.04  SUBMITTALS

A. Product Data: Provide for all accessory items.

B. Submit for LEED Credit documentation.

1. Refer to Section 01 8113 “Sustainable Design Requirements” for additional LEED submittal requirements.

2. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building’s weatherproofing system.
1.05 PRODUCT DELIVERY AND STORAGE

A. Deliver materials in original mill protective wrapping, and store inside protected from weather, moisture and soiling.

B. Protect materials against damage of any kind. Damaged products, including soiled fabrics, will be rejected.

PART 2 PRODUCTS

2.01 CARPET

A. Owner furnished.

2.02 ACCESSORIES

A. Adhesive: Non-toxic, waterproof, white latex base cement formulated for the installation of the manufactured materials. Type as recommended by carpet manufacturer.

1. Toxicity/IEQ: Adhesive must not have a VOC content greater than 50 g/L less water and exempted solids, as prescribed by South Coast Air Quality Management District Rule 1168.

B. Miscellaneous Materials: As recommended by manufacturer of carpet and other carpeting accessory products; selected by installer to meet project circumstances and requirements.

C. Leveling Materials and Crack Fill: Non-staining latex cementitious type, compatible with carpet adhesive, as recommended by the flooring manufacturer.

D. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 EXECUTION

3.01 PREPARATION

A. Installer must examine substrates for moisture content and other conditions under which carpeting is to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work.

1. Do not proceed until unsatisfactory conditions have been corrected.

B. Comply with CRI 2011 and with carpet manufacturer’s written installation instructions for preparing substrates indicated to receive carpet installation.

C. Concrete Substrates
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by flooring manufacturer. Do not use solvents.

3. Perform tests recommended by flooring manufacturer. Proceed with installation only after satisfying manufacturer's recommendations for test results.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

F. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.02 INSTALLATION

A. Install in accordance with recommendations of the manufacturers of materials and Carpet and Rug Institute's methods specified in CRI 2011. Carpet manufacturer's current installation instructions shall be kept at job site and be followed explicitly.

1. Comply with manufacturer's recommendations for installation of carpet; maintain uniformity of carpet direction and lay of pile, unless otherwise indicated.

B. Use modular carpet from the same dye lot in each room.

C. Install modular carpet by trimming, cutting and prefitting units. Then apply adhesive in strict accordance with manufacturer's instructions, and place the carpet modules with the pile inclination in the direction as recommended by the manufacturer, or as otherwise indicated on the final layout drawings.

1. Application shall be full spread. Sprayed on adhesive is not permitted.

D. Trim protruding ends of open loops so slightly below surrounding pile height.

E. Use edge molding where carpet terminates under doors and along edge of carpet where it abuts another floor material. Fasten edge moldings securely to the floor with glue manufactured for this specific purpose.

F. Roll entire area lightly to eliminate air pockets and ensure uniform bond.
3.03 CLEANING AND PROTECTION

A. Protect installed carpet to comply with CRI 2011 and carpet manufacturer recommendations.

B. Remove debris, sorting pieces to be saved from scraps to be disposed. Keep premises free and clear of waste material in connection with carpet work.

C. Vacuum carpet using commercial machine with face-beater element. Remove spots and replace carpet where spots cannot be removed.

D. Advise Contractor of protection methods and materials needed to ensure that carpeting will be without deterioration or damage at time of substantial completion.

E. Provide adequate protection for adjacent equipment, furnishings and materials.

END OF SECTION
SECTION 09 91 00

PAINTING

PART 1  GENERAL

1.01  SCOPE

A. Work Included

1. Surface preparation and painting or finishing of all interior and exterior exposed items and surfaces except as otherwise indicated. Work includes, but is not necessarily limited to, the following:
   a. Walls, ceilings and soffits.
      1) Gypsum board
   b. Concrete masonry walls.
   c. Hollow metal doors and frames.
   d. Exposed structure including deck and all framing.
   e. Exposed ferrous metal of any type, interior and exterior, including galvanized items.
   f. Exposed sheet metal, ductwork, conduit and piping in finished spaces; not mechanical equipment or electrical equipment rooms.
   g. Exposed prime coated or unfinished mechanical or electrical items outside of mechanical equipment rooms. Repaint factory finished mechanical or electrical items where specified.
   h. Stenciling of fire walls above ceilings.
   i. Other items noted or specified.

2. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other sections of the work.

B. Mechanical Equipment Rooms: Painting subject to the following requirements:

1. Paint finish on walls and ceiling, when scheduled on drawings, to be applied prior to installation of mechanical/electrical work as much as possible.
2. Spray painting not permitted after electric motors have been installed.

C. Work Excluded: Do not paint the following items unless specifically called for on the drawings or specified herein:

1. Concrete floors.
2. Shop or prime coats on items to which shop or prime coats have been applied by the fabricator, unless noted otherwise.
4. Items with factory finish or natural finish (brick, stone, stainless steel, aluminum, and others) unless noted or indicated elsewhere.
5. Colored concrete masonry units.
6. Wall areas permanently concealed by fixed equipment or accessories.
7. Concealed, miscellaneous metal, except for shop prime coat touch-up.
8. Factory finished equipment, except for touch-up, unless otherwise specified herein.
9. Items permanently concealed above ceilings.

D. Surface Preparation

1. It is the intention of this specification that new substrates will be ready for decoration as specified herein except for normal construction dust and soiling.
2. Surfaces and materials installed by other trades are required to be acceptable for work specified under Part 3, Surface Preparation. Specifically, new surfaces to be clean, sound, free from loose particles, dirt, loose mortar and grease.
3. Existing Surfaces: Unless otherwise specified, provide all surface preparation required for decoration.

1.02 RELATED SECTIONS

B. Sustainable Design Requirements: Section 01 81 13.

1.03 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.

1.04 QUALITY ASSURANCE

A. Application: Performed only by skilled, experienced painters.
B. Provide lead free prime and finish coatings. All top coatings shall be mold and mildew resistant.

C. Coordination: Provide finish coats compatible with prime paints used. Review other specification sections to ensure compatibility of total coating system with prime paints provided for the various substrates. Provide barrier coats over non-compatible primers or remove primer and reprime as required. Notify the Architect of anticipated problems using coating systems specified on substrates primed in accordance with other section requirements.

D. Reference Specifications

1. The following Society for Protective Coatings (SSPC) specifications are referenced by code number within this Section.

<table>
<thead>
<tr>
<th>Code</th>
<th>Method</th>
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<tbody>
<tr>
<td>SP-1</td>
<td>Solvent Cleaning</td>
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<tr>
<td>SP-2</td>
<td>Hand Tool Cleaning</td>
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<td>SP-3</td>
<td>Power Tool Cleaning</td>
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<tr>
<td>SP-6</td>
<td>Commercial Blast Cleaning</td>
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<tr>
<td>SP-11</td>
<td>Power Tool Cleaning to Bare Metal</td>
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<tr>
<td>SP-16</td>
<td>Brush-off Blast Cleaning of Non-Ferrous Metals</td>
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E. Paint walls prior to installing wall mounted signage.

F. Prepainting Walk-Through: In areas where ceilings and walls are scheduled or indicated to be field painted, and equipment, ductwork, piping, conduit and other wall/ceiling mounted or suspended items are exposed, the areas are to be reviewed to determine colors of the various items.

1. Attendance: Contractor, painter and Architect.
2. Items to be painted colors other than the background wall or ceiling will be identified.

1.05 SUBMITTALS

A. Submit a complete selection of manufacturer's color chips indicating color, texture and sheen for approval for each finish specified herein.

B. Submit a complete schedule for identifying manufacturer and specific brand name or number of products proposed for finishing specified surfaces.

1. Provide percent of solids by volume content data for each paint material.
2. Provide paint label analysis and application instructions for each type paint.
C. Provide one (1) unopened gallon of each type and color of paint and stain required for maintenance purposes. Provide original, unopened, labeled containers with color samples and a list of project use. Extra materials are not to be used for touch-up by Contractor.

D. Color/Finish Samples

1. After receiving color chips from the Contractor, the Architect will provide a complete schedule of colors and sheens desired.
2. Obtain schedule well in advance of commencing work and submit samples of specified finishes for approval.
3. Submit duplicate samples on the same kind of materials to which finishes will be applied. One half of the sample shall show the completed treatment and the other half shall show the successive steps, taken in producing the finish. When approved, samples will be so marked; one set will be retained by the Architect and one set will be returned for the painter's use.
4. No finishes shall be applied on the work until samples are approved. Approved samples shall be strictly duplicated in the work. Additional coatings, if required to reproduce approved samples, shall be applied without additional cost to the Owner.
5. Use representative colors when preparing samples for Architect's review.

E. Special Environmental Requirements: Submit the following in accordance with Section 01 81 13:

1. Product Data: For painting and coatings, documentation indicating VOC Content

F. Statement From Manufacturer

1. Contractor, in submitting the list of proposed subcontractors, shall include for approval, along with the name of the painting subcontractor, the names of the manufacturers whose materials the subcontractor proposes to use in the work.
2. Following tentative approval of the subcontractor and the materials manufacturers, notify the manufacturers, in writing, that the specifications require the manufacturers to submit to the Architect, a statement by a corporate officer of the manufacturer that coatings scheduled by the Architect are proper for the intended use and that the manufacturer's representative will be available to advise the Architect and the Contractor regarding applications of all coatings.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials on the job site in original, new, unopened packages and containers bearing the manufacturer's name and label, and the following information:

1. Name or title of material.
2. Manufacturer's name, stock number and date of manufacture.
3. Contents by volume, for major pigment and vehicle constituents.
4. Thinning instructions.
5. Application instructions.
6. Color name and number.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage and deterioration. Store paint materials at minimum of 50°F.

C. Maintain paint material storage space as clean, non-hazardous and orderly. Place waste and soiled paint rags in tightly covered metal containers; safely dispose of at end of each working day. Take every precaution to avoid fire hazards and spontaneous combustion. Provide acceptable type of fire extinguisher immediately adjacent to paint storage area.

1.07 PROJECT CONDITIONS

A. Coordinate painting and finishing work with other trades to ensure adequate illumination, ventilation and dust-free environment during application and drying of paint and finish treatments.

B. Maintain uniform interior building temperature of minimum 50° F for 24 hours before, during and continuously for 48 hours after painting.

C. Do not apply coatings when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide adequate ventilation as required for specified paint and finish treatment materials in spaces scheduled. Maintain for time periods recommended by material manufacturer to provide proper drying.

E. Provide adequate illumination on surfaces to be finished. Maintain a minimum 80 foot candle lighting level measured mid-height at substrate surface.

F. Protect adjoining surfaces against damage or soiling.

G. Maintain work in neat and orderly condition, promptly removing empty containers, wrappings, soiled rags, waste and rubbish from site.

H. Material Safety Data Sheets (MSDS): Provide documents available to Owner's Representative and construction personnel at the job site. Comply with MSDS requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Paint: Brands of paint and stain are specified in "Paint and Material Finish Schedule," only to establish a standard of quality.
Other paint brands and manufacturers such as BENJAMIN MOORE; AKZO NOBEL (GLIDDEN PROFESSIONAL and DEVOE COATINGS); MARTIN SENOUR; PPG; PRATT AND LAMBERT; PORTER; CORONADO PAINT COMPANY, SHERWIN WILLIAMS are acceptable upon proof of satisfactory experience records for the intended use and compliance with specified VOC content.

1. Colors: As indicated on drawing; colors not indicated to be as selected by Architect.

2.02 MATERIAL GENERAL

A. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

B. Material Compatibility

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Stains: Factory-mixed, penetrating, transparent oil-base type. Applicator shall be allowed to add approved colorants on the job to match approved samples. No other ingredients shall be added to stains.

2.03 ACCESSORY MATERIAL

A. Application Equipment: Not required to be new, but shall be adequate for the work and workmanship required herein.
B. Accessories: Provide all required ladders, scaffolding, drop cloths, masking, scrapers, tools, dusters and cleaning solvents as required to perform the work and achieve the results specified herein.

C. Secondary products not specified by name (i.e. turpentine, thinners, mineral spirits, fillers, linseed oils, etc.) shall be "best grade" or "first line" products.

2.04 EXTERIOR PAINT AND FINISH MATERIAL SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Metals - Ferrous: Galvanized and Shop Primed (Semi-Gloss).

1. SW

2. PPG

3. GLIDDEN PROFESSIONAL


C. Metal – Ferrous: Unprimed (Semi-Gloss).

1. SW

2. PPG

3. GLIDDEN PROFESSIONAL
   a. Primer: Devflex 4020 Direct to Metal Primer; One (1) coat.

2.05 INTERIOR PAINT AND FINISH MATERIALS SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Gypsum Board and Plaster – Walls.
1. **SW**  

2. **PPG**  
   a. Primer: SpeedHide Interior Latex Primer 6-2 Series.  
   b. Finish: Speedhide Zero 6-4310XI Series; latex eggshell. Two (2) coats.  

3. **GLIDDEN PRO**  
   a. Primer: Lifemaster No VOC Interior Primer 9116-1200. One (1) coat.  
   b. Finish: Lifemaster No VOC Interior Latex Eggshell Paint 9300 Series. Two (2) coats.  

**C. Gypsum Board and Plaster – Walls - Epoxy**  
1. **SW**  
   b. Finish: W/B Catalyzed Epoxy B70 Series. Two coats.  

2. **PPG**  
   a. Primer: Speedhide Interior Latex Primer Sealer 6-2 Series. One (1) coat.  

3. **GLIDDEN PRO**  

4. **Surfaces:** Where indicated.  

**D. Gypsum Board and Plaster – Ceilings/Soffits.**  
1. **SW**  

2. **PPG**  
   a. Primer: SpeedHide Interior Latex Primer 6-2 Series.  
   b. Finish: Speedhide Zero 6-4110XI Series; latex flat. Two (2) coats.  

3. **GLIDDEN PRO**  
   a. Primer: Lifemaster No VOC Interior Primer 9116-1200. One (1) coat.  
   b. Finish: Lifemaster No VOC Interior Latex Flat Paint 9100 Series. Two (2) coats.  

**E. Concrete Masonry Surfaces (Semi-Gloss).**
1. **SW**
   a. **Filler:** Preprite Block Filler B25W25. Minimum 8 mil dft to pin hole free.
   b. **Finish:** ProMar 200 Zero VOC Interior Latex Semi Gloss B31 Series. Two (2) coats.

2. **PPG**
   a. **Filler:** Speedhide Block Filler Latex 6-7 Series. Minimum 8.5 mil dft to pin hole free.
   b. **Finish:** Pitt-Tech Plus Int/Ext Semi-Gloss DTM Industrial Enamel 90-1210 Series. Two (2) coats.

3. **GLIDDEN PROFESSIONAL**
   a. **Filler:** 3010 Ultra-Hide Latex Block Filler. Pin hole free.
   b. **Finish:** Lifemaster Semi-Gloss 9200 Series. Two (2) coats.

**F. Concrete Masonry Surfaces (Semi-Gloss): Epoxy**

1. **SW**
   a. **Filler:** Loxon Block Surfacer A24W200. 8 mil dft to pin hole free.
   b. **Finish:** SW W/B Catalyzed Epoxy B70 Series. Two coats.

2. **PPG**
   a. **Filler:** Speedhide Int/Ext Acrylic Masonry Block Filler 6-15 Series. Minimum 8 mils dft to pin hole free.
   b. **Finish:** Pitt-Glaze Water Base Water-Borne Acrylic Epoxy Semi-Gloss 16-551 Series. Two (2) coats.

3. **GLIDDEN PRO**
   a. **Primer:** Devoe Coatings Bloxfil 4000 Interior/Exterior Heavy Duty Acrylic Blockfiller, 4000-1000. Minimum 8 mils dft to pin hole free.
   b. **Finish:** Devoe Coatings Tru-Glaze-WB 4426 Waterborne Epoxy Semi-Gloss. Two (2) coats.

**G. Metals - Ferrous: Shop Primed and Unprimed**

1. **SW**
   a. **Primer:** S-W Pro Industrial Pro-Cryl Primer, B66-310 Series
   b. **Finish:** S-W Direct-to-Metal DTM Acrylic Semi-Gloss Coating, B66-200. Two (2) coats.

2. **PPG**
   a. **Primer:** Pitt-Tech DTM Acrylic Primer 90 Series. One (1) coat.
   b. **Finish:** Pitt-Tech Plus Int/Ext Semi-Gloss DTM Industrial Enamel 90-1210 Series. Two (2) coats.

3. **GLIDDEN PROFESSIONAL**
   a. **Primer:** Devoe Coatings Devflex 4020PF Direct to Metal Primer/Finish 4020.
   b. **Finish:** Devflex 4216 Int/Ext Acrylic Latex Semi-gloss Enamel. Two (2) coats.

4. **Surfaces:** Hollow metal doors, frames, door mullions, railings, ferrous metal surfaces.
H. Metals - Ferrous: Galvanized.

1. SW
   a. Primer: ProCryl Universal Metal Primer B66-310 Series

2. PPG
   b. Finish: Speedhide Interior Semi-Gloss Enamel, 6-500 Series. Two (2) coats.

3. GLIDDEN PRO
   a. Primer: DevFlex 4020 Direct to Metal Primer 4020PF.
   b. Finish: Devflex 4216 Int/Ext Acrylic Latex Semi-gloss Enamel. Two (2) coats.

4. Surfaces: Hollow metal doors, frames, door mullions, railings, galvanized metal surfaces.

I. Exposed Structure - Ferrous (Eg-Shel): Dryfall

1. SW
   a. Primer: ProCryl Universal Primer, B66-310 Series (2-4 mils dft)
   b. Finish: Low VOC Waterborne Acrylic Dry Fall, B42W82 Two coats at minimum 4.5 mils dft.

2. PPG
   b. Finish: Speedhide Interior Super Tech WB Acrylic Dry Fog Latex, 6-725 two coats at minimum 2.5 mil dft per coat.

3. GLIDDEN PRO
   a. Primer: Devflex DTM Waterborne Acrylic Primer #4020PF; 1 coat.


J. Exposed Structure - Galvanized (Flat): Dryfall

1. SW
   a. Finish: Low VOC Waterborne Acrylic Flat Dry Fall, B42W81 Two coats at minimum 2.5 mils dft per coat.

2. PPG
   a. Finish: Speedhide Interior Super Tech WB Acrylic Dry Fog Latex, 6-725 two coats at minimum 2.5 mil dft per coat.

3. GLIDDEN PRO
   a. Finish: Waterborne Interior Flat Dry Fall #1280; 2 coats.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrate surfaces and installation condition. Report condition(s) that might affect proper application.
B. Do not proceed with painting work until unsatisfactory conditions have been corrected.

C. Initial application of paint to a surface constitutes acceptance of existing conditions and responsibility for satisfactory performance.

D. Examine specification sections of other trades and their provisions regarding painting. Surfaces left unfinished shall be painted or finished as part of the work of this Section unless specifically noted otherwise.

3.02 SURFACE PREPARATION

A. General

1. Broom clean and remove excess dust before painting is started in any area.

2. Broom cleaning is not permitted after operations have begun in a specific area.

3. Surfaces shall be clean, dry and adequately protected from dampness.

4. Surfaces shall be free of any foreign materials that will adversely affect adhesion or appearance of applied coating.

5. Remove any mildew and neutralize the surface prior to applying coating.

B. Concrete Masonry and Concrete

1. Remove splatters, dust and dirt by brushing or water washing with clear water.

2. Remove misplaced mortar.

3. Cracks, abrasions and other defects shall be cut out, patched flush, and sanded smooth and sealed before applying prime coat.

D. Structural Steel and Miscellaneous Ferrous Metal

1. Bare Metal Surfaces

   a. Remove grease, oil, dirt and other foreign material prior to prime coat application where necessary according to SP-1, SP-2 and/or SP-3.

   b. Remove rust prior to prime coat application according to SP-11.

   c. Include all hangers and miscellaneous fabricated items.

2. Shop Primed Surfaces

   a. Fill open joints or abrasions in shop prime coat with filler; feather edges, sand smooth, and touch-up with primer compatible with shop primer. Extend primer beyond treated area.

   b. Remove grease, oil, dirt and other foreign material prior to prime coat touch-up where necessary according to SP-1, SP-2 and/or SP-3.

   c. Include all hangers and miscellaneous fabricated items.

E. Galvanized or Zinc-Coated Items
1. Pretreat surfaces prior to application of prime coat with phosphate pretreatment, similar to Great Lakes Labs, “Clean and Etch”, Dupont's Metal Conditioner #5717 or PPG DX 579, unless prime coat material to be used is recommended by its manufacturer for direct application over zinc treated surfaces of the type at hand. Follow manufacturer's directions.

2. Remove dirt or grease on surfaces scheduled for paint finish according to SP-1. Wipe dry with clean cloths.

3. Roughen surface with steel wool as necessary to remove gloss.

F. Gypsum Board

1. Fill minor irregularities with spackling paste.
2. Sand to smooth level surface and dust off.
3. Avoid raising nap of paper.

G. Factory Primed Items: Verify compatibility between factory applied primer and finish painting system. If compatibility cannot be guaranteed, then provide barrier coat compatible with both finishes.

H. Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants. If aluminum does not come from the manufacturer with an approved paint grip finish, consult the coating manufacturer for the appropriate surface preparation requirements. Minimum requirement to meet SSPC SP 16.

3.03 APPLICATION

A. General

1. Only skilled mechanics shall be used.
2. Apply all paint in strict accordance with the manufacturer's instructions. Data sheets take precedence over these specifications if more restrictive.
3. Do not apply until preceding coat is dry to manufacturer's recommendations.
4. Do not apply to any surface unless it is thoroughly dry.
5. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes if moisture content of surface is greater than recommended by manufacturer.
6. Do not use material that has exceeded the pot life stated by the manufacturer.
7. Apply to the following workmanship requirements:
   b. Absence of ridges, sags, runs, drops, laps, unnecessary brush marks, holidays, air bubbles and excessive roller stipple.
   c. Thorough mixing of paint and limited use of thinners.
   d. Uniformity of film thickness.
   e. Proper drying time between coats.
   f. Protection of unpainted and finished surfaces.
8. Coverage and hide shall be complete. When color or undercoats show through final coat, recoat until the paint film is of uniform finish, color, appearance, and coverage, at no additional cost to Owner.
9. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping.

B. Methods

1. Application may be by roller, brush, spray or other approved means.
2. When utilizing spraying, be careful not to use methods which will affect other trades work in adjacent areas.

C. Mixing

1. Mechanically mix before use.
2. Agitate during application as required.
3. Do not tint or shade in field unless permitted by Architect.

D. Thinning

1. Dilute only as required to achieve suitable application viscosity.
2. Use only type and amount recommended by manufacturer.

E. Approvals: Do not apply succeeding coat of paint until previous coat has been inspected and written approval is given.

F. Electrical Conduits

1. Do not paint any electrical conduit or boxes unless they are exposed and abutting a surface that is to be painted or stained.
2. Conduits and boxes to be painted shall be given a coat of galvanizing pretreatment followed by the paint system for the adjoining surface.

G. Protection of Surfaces

1. Provide covers, drop cloths and masking to protect unpainted surfaces previously finish painted. Use special care in protecting electrical and mechanical items which may be damaged by the painting operations (i.e., overspray and solvents that might damage the internals of the item).
2. If possible, remove items not to be painted such as hardware, accessories, electrical plates, lighting fixtures and/or trim, mechanical grilles and louvers and similar items in contact with painted surfaces.
3. Use caution when painting exterior work to avoid wind carrying overspray, drippings, etc., onto adjacent structures, facilities and vehicles.
4. Following completion of painting, reinstall removed items by workmen skilled in the trade involved and remove all covers, masking and drop cloths.

H. Fire and Smoke Partitions: Conform to IBC 703.7.
1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 3 inches high with a minimum 3/8 inch stroke in contrasting color.

2. Stenciled message: "SMOKE PARTITION or X HOUR FIRE PARTITION – PROTECT ALL OPENINGS" as applicable.

3. Locate within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.

4. Use semi-gloss paint of color that contrasts with color of substrate.

5. Locate approximately 12” above ceiling tile.

END OF SECTION
PART 1 GENERAL

1.01 WORK INCLUDED
A. Preparation of surface and application of elastomeric coating to exterior face of concrete tilt-up wall.

1.02 QUALITY ASSURANCE
A. For the purpose of designating the minimum functional, aesthetic and quality standards required for the work of this section, proprietary products are specified.
B. Installation: Performed an applicator trained and approved by the system manufacturer. During application, the work shall be inspected by system manufacturer's representative.
   1. Minimum 3 years experience installing specified finish system/coating.
C. Sample Area: Provide a sample wall application area not less than 4'-0" by 4'-0" in size, showing selected color, workmanship, and finish texture proposed for the work. Sample panel shall contain all materials and components of the full scale work. Location as directed by the Architect. Sample area may be a portion of the work and, when accepted by the Architect, remain in place.

1.03 SUBMITTALS
A. Manufacturer's Product Data: Clearly describing surface preparation, quality, performance, application procedures, and available colors.

1.04 DELIVERY, HANDLING, STORAGE
A. Deliver products to job-site in original unopened packages bearing manufacturer's labels.
   1. Comply with Section 01 60 00.
B. Store and protect products in accordance with manufacturer's recommendations.
   1. Maintain temperature and humidity within ranges required by manufacturer's instructions.
PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturer/System

1. Basis of Design: Specifications are based on Sikagard 550W Elastocolor 100% acrylic emulsion manufactured by SIKA CORPORATION
2. Other Manufacturers: Subject to requirements, products by SEALOFLEX WATERPROOFING SYSTEMS, SHERWIN WILLIAMS, PPG, CHEMREX are acceptable.

2.02 MATERIALS

A. Elastomeric Coating Material: 100% acrylic emulsion with the following properties:

1. Tensile properties (ASTM D-412 Modified) 7 day tensile strength 190 psi.
2. Elongation at break 610% @ 73 degrees F, 230% @ 0 degrees F).
4. Resistance to wind driven rain (TT-C-555B): No passage of water through coating.
5. Weathering (ASTM G-23) 10,000 hours excellent, no chalking or cracking.
6. Moisture vapor permeability (ASTM E96): 14.5 perms
7. Water vapor diffusion: µH₂O, 2,146
8. Water vapor diffusion resistance at 16 mils thick: SdH₂O = 2.6 ft. (0.8m) equivalent air thickness.
9. Solids content: by weight: 62%, by volume: 55%
11. Colors: As selected by Architect.

B. Patching Mortar: Manufacturer’s standard patching mortar; type as recommended for substrate material.

C. Surface Primer: Type as recommended by manufacturer.

D. Joint Sealant: See Section 07 92 00.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify substrate surfaces are durable; free of frozen matter, dampness, loose particles, cracks, pits, projections, or foreign matter detrimental to adhesion or application of system.

B. Verify that substrate surfaces are smooth, and not detrimental to full contact bond of elastomeric coating materials.
3.02 PREPARATION

A. Protect adjacent surfaces not designed to receive coating.

B. Clean and prepare surfaces by removing all loose and flaking particles, grease and laitance by pressure-washing or other method approved by manufacturer.

C. Do not apply elastomeric coating to surfaces unacceptable to manufacturer.

D. Seal cracks and joints greater than 12 mils (0.3 mm) wide with manufacturer’s recommended sealant material.

3.03 APPLICATION

A. General

1. Spray, roll, or brush apply coating in accordance with manufacturer's instructions.
2. Thoroughly apply coating materials into joints, crevices, and open spaces.
3. Apply coatings at rate recommended by manufacturer.
4. Apply material free of runs, drops, ridges, waves, laps, brush marks, and variations in color.

B. Thickness: 15 mil minimum cured total system thickness; comprised of three coats, including primer.

3.04 CLEANING

A. Immediately clean unscheduled surfaces receiving elastomeric coating in accordance with manufacturer's instructions.

END OF SECTION
PART 1  GENERAL

1.01  SUMMARY

A. Section Includes

1. Steel toilet compartments configured as toilet enclosures and urinal screens.

1.02  RELATED SECTIONS

A. Toilet Accessories: Section 10 28 13.

1.03  SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.
3. Show locations of centerlines of toilet fixtures.

C. Samples: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for units, prepared on 6-inch- square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

D. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.04  QUALITY ASSURANCE

A. Take field measurements prior to fabrication to assure proper fitting.

B. Provide setting drawings, templates, instructions and directions for installation of anchorage devices.

C. Installer Qualifications: Minimum five (5) years continuous experience installing toilet compartments on projects of equivalent size, quantity and complexity.
D. Regulatory Requirements: Conform to ANSI A117.1 code for access for the handicapped operation of toilet compartment door and hardware.

1.05 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.

1.06 DELIVERY, STORAGE AND HANDLING
A. Deliver items in manufacturer's original unopened protective packaging. Store materials in original packaging to prevent soiling, physical damage or wetting.
B. Handle so as to prevent damage to finish surfaces.

PART 2 PRODUCTS

2.01 MATERIALS
A. Aluminum Castings: ASTM B 26/B 26M.
B. Aluminum Extrusions: ASTM B 221.
C. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
   Hot-Dip Galvanized: ASTM A 653, either hot-dip galvanized or galvannealed.
D. Stainless-Steel Castings: ASTM A 743/A 743M.

2.02 MANUFACTURERS
1. ASI
2. AMERICAN SANITARY
3. BRADLEY CORPORATION - MILLS
3. METPAR
4. HADRIAN
5. AMPCO
6. GLOBAL STEEL PRODUCTS
7. GENERAL PARTITIONS

2.03 STEEL UNITS
A. Toilet-Enclosure Style: Overhead braced.
B. Urinal-Screen Style: Wall hung, flat panel.
C. 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. 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.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

D. Urinal-Screen Construction: Matching panel construction.

E. Facing Sheets and Closures: Electrolytically coated or hot-dip galvanized-steel sheet with nominal base-metal (uncoated) thicknesses as follows:

1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.036 inch.
2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than 0.048 inch.
3. Panels: Manufacturer's standard thickness, but not less than 0.030 inch.
4. Doors: Manufacturer's standard thickness, but not less than 0.030 inch.
5. Flat-Panel Urinal Screens: Thickness matching the panels.

F. Pilaster Shoes: Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

G. Brackets (Fittings)

1. Stirrup Type: Ear or U-brackets; stainless steel.
2. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

H. Steel-Sheet Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on finish, including thermosetting, electrostatically applied, and powder coatings. Comply with coating manufacturer's written instructions for applying and baking.

1. Colors: As selected by Architect.

2.04 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position.

3. Latch and Keeper
   Latch and Keeper: Recessed latch unit, with combination rubber faced door strike and keeper.
   a. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.
   b. Latch units shall have emergency access capability.

4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.

5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.

6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. 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 or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.06 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for for compartments that meet the requirements of the Americans with Disabilities Act (ADA).

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive toilet compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that may affect installation of compartments. Report any discrepancies to the architect.

1. Take complete and accurate measurements of complete toilet compartment locations.

2. Start of work constitutes acceptance of job.
3.02 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. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact. Continuous brackets.

3.03 ADJUSTING

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

END OF SECTION
SECTION 10 22 13

WIRE MESH PARTITIONS

PART 1  GENERAL

1.01  WORK INCLUDED

A. Provide wire mesh partitions (enclosures) with slide type doors.

1.02  SHOP DRAWINGS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wire mesh items.

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

1. Include clearances required for operation of doors.

C. Setting Drawings: For anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

1.03  DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials in original shipping cartons. Store in clean, dry place, protected from weather and physical damage.

1.04  JOB CONDITIONS

A. Take field measurements prior to fabrication, where possible, to ensure proper fitting of the work.

B. Coordinate with other related trades as required in setting anchorage devices required for wire mesh partition work.

PART 2  PRODUCTS

2.01  MANUFACTURERS

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

1. ACORN WIRE & IRON WORKS, INC.
2. KENTUCKY METAL PRODUCTS COMPANY
3.  INDIANA WIRE PRODUCTS
4.  STANDARD WIRE AND STEEL WORKS

2.02  MATERIALS

A.  Steel Wire:  ASTM A510.

B.  Steel Plates, Channels, Angles, and Bars:  ASTM A36.

C.  Cold-Rolled Steel Sheet:  ASTM A1008, Commercial Steel (CS), Type B.

D.  Steel Pipe:  ASTM A53, Schedule 40 unless another weight is indicated or required by structural loads.

E.  Square Steel Tubing:  ASTM A500, cold-formed structural-steel tubing.

F.  Metallic-Coated Steel Sheet:  ASTM A653, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.

G.  Panel-to-Panel Fasteners:  Manufacturer's standard steel bolts, nuts, and washers.

H.  Postinstalled Expansion Anchors:  With capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
   1.  Carbon Steel:  Zinc plated to comply with ASTM B 633, Class Fe/Zn 5 for Class SC 1 service condition (mild).
   2.  Stainless Steel:  ASTM F593 and ASTM F594, Alloy Group 1 or 2, for bolts and nuts; ASTM A276 or ASTM A666, Type 304 or 316, for anchors.

I.  Power-Actuated Fasteners in Concrete:  Fastener system of type suitable for application indicated and fabricated from corrosion-resistant materials; with clips or other accessory devices for attaching hangers of type indicated.


2.03  WIRE MESH PARTITIONS

A.  Mesh:  0.135-inch- diameter, intermediate-crimp steel wire woven into 1-1/2-inch diamond mesh.

B.  Vertical Panel Framing:  1-1/4-by-5/8-by-0.097-inch cold-rolled, C-shaped steel channels with 1/4-inch- diameter bolt holes spaced not more than 18 inches o.c. along center of framing.

C.  Top Capping Bars:  2-1/4-by-1-inch cold-rolled steel channels.
D. Posts for 90-Degree Corners: 1-1/4-by-1-1/4-by-1/8-inch steel angles with 1/4-inch-diameter bolt holes aligning with bolt holes in vertical framing; with floor anchor clips.

E. Posts for Other-Than-90-Degree Corners: Manufacturer's standard steel pipe or tubing with 1/4-inch-diameter bolt holes aligning with bolt holes in vertical framing.

1. Partitions up to 12 Feet High: 1-1/4-inch OD.

F. Adjustable Corner Posts: 2, manufacturer's standard steel pipe or tubing posts connected by steel hinges at 36 inches o.c. attached to posts; with 1/4-inch-diameter bolt holes aligning with bolt holes in vertical framing.

G. Line Posts: 3-inch-by-4.1-lb or 3-1/2-by-1-1/4-by-0.127-inch steel channels; with 5-by-18-by-1/4-inch steel base plates punched for attachment to floor.

H. Floor Shoes: Steel, cast iron, or cast aluminum, not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.

I. Sliding Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch steel channels or C-channels, banded with 1-1/2-by-1/8-inch flat steel bar cover plates on 4 sides.

1. Hardware: Two, four-wheel roller-bearing carriers, box track, and bottom guide channel for each door.
2. Cylinder Lock: Mortise type with cylinder specified in Section 08 71 00 "Door Hardware"; operated by key outside and lever inside.

J. Accessories

1. Adjustable Filler Panels: Not less than 0.060-inch-thick, cold-rolled steel sheet; capable of filling openings from 2 to 12 inches.
2. Wall Clips: Manufacturer's standard, cold-rolled steel sheet.

N. Finish: Powder-coated finish.

2.04 FABRICATION

A. Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. As required for complete installation, provide bolts, hardware, and accessories with manufacturer's standard finishes.

1. Fabricate wire mesh items to be readily disassembled.
2. Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
3. Align bottom of door with bottom of adjacent panels.
4. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.

B. Layout and Location: Where indicated.

2.05  FINISH

A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning".

B. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer’s standard 2-coat, finish, consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat.

1. Color: As selected by Architect from manufacturer’s full range.

PART 3  EXECUTION

3.01  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 wire mesh items will be installed.

C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.

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

3.02  INSTALLATION

A. Perform work in accordance with manufacturer’s instructions and recommendations.

3.03  ADJUSTING AND CLEANING

A. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Remove and replace defective work including doors and framing that are warped, bowed, or otherwise unacceptable.

C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
D. Dispose of all metal scraps and packaging material collected during installation of partitions.

E. Sweep floor and leave clear for other trades.

END OF SECTION
PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Unitized-panel demountable partitions.

1.02 QUALITY ASSURANCE

A. Provide wall system components from one manufacturer which certifies that materials meet these specifications.

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

1.03 SUBMITTALS

A. Shop Drawings: Include panel layout in plan and elevation, opening locations, special panels, conditions at adjacent construction, and accessories.

B. Product Data: Provide data on panel system, components, and accessories.

C. Samples: Submit 2 samples 12" long x full width indicating trim finish.

D. Manufacturers Installation Instruction: Indicate procedures, special conditions, and protection.

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

2. Ductwork above ceiling.

1.04 FIELD CONDITIONS

A. Finished Spaces: Do not deliver or install demountable partitions until finishes in spaces to receive them are complete, including suspended ceilings, floors, carpeting, and painting.

1.05 DELIVERY, STORAGE AND HANDLING

A. Ship prefinished materials to the job site in their original unopened cartons or other protective packaging necessary to protect finishes. Store materials in such packages until time of application. Ship and store panels using methods that provide adequate support to ensure flatness and prevent damage.
**PART 2  PRODUCTS**

2.01  MANUFACTURER

A. Basis of Design: DIRTT ENVIRONMENTAL SOLUTIONS.

B. Other Manufacturers: Subject to requirements, demountable partitions manufactured by the following are acceptable:

1. HAWORTH.
2. KI.
3. STEELCASE.

2.02  PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

B. Structural Performance: Provide demountable partitions capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Transverse-Load Capacity: Lateral deflection of not more than 1/240 of the overall span when tested under a uniformly distributed load of 5 lb/sq. ft. according to ASTM E 72.

C. Acoustical Performance: Where acoustical rating is indicated, provide demountable partition assembly tested by a qualified testing agency 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.

2.03  UNITIZED-PANEL DEMOUNTABLE PARTITIONS

A. General: Unitized, demountable-partition assembly and components that are the standard products of manufacturer.

1. Unitized solid wall partitions shall be four inches thick in cross section,

B. Acoustical Rating: STC 44.

C. Unitized Panels:

1. Unitized Solid Wall system shall have components which can be disassembled, relocated, and substantially reused.
   a. System shall consist of vertical MDF face panels with 3-dimensional laminate wrapped around all edges or similar,
b. Face tiles which clad the aluminum frame, may be monolithic or segmented and will allow for integrated hang on components of other manufacturers’ origin without defacing or damaging face tile, substrate of structural frame. Tiles can span off-module in segments or monoliths, vertically and horizontally.

c. Integrated accessory channels are designed into the structural frame allowing for accessible power and data; hang on accessories, storage and furniture component bearing. Panel shall also provide aluminum or veneer wrapped aluminum leveling floor base, top rail (for stand alone) or ceiling track attached top track, hidden or visible zippers or angled / pivot zipper for angled and corner connections for panel to panel connections, trim, and accessories.

d. Wall panel shall be four inches thick and provide two inches wide cavity for distribution of utilities readily accessed from either side of wall via removable face tiles.

e. Interior frame is unitized aluminum assembly to accept face tiles and any hang on components.

f. Maximum panel height is 10’ at full 60 inches maximum width, up to 14 feet height with diminishing maximum width.

2. Walls shall connect to and release from the base building through carpet grippers and side frames at gypsum board partitions.


4. Base trim to be silver or black Santoprene continuous base between frame and flooring.

2.04 FABRICATION

A. General: Fabricate demountable walls for installation with concealed fastening devices and pressure-fit members that will not damage ceiling or floor coverings. Fabricate systems for installation with continuous seals at floor, ceiling, and other locations where partitions abut fixed construction.

B. Panels for Unitized-Panel Demountable Partitions: Factory-assembled, flush, unitized-panel construction; with faces smooth and free of buckles, oil-canning, and seams; and insulated with solidly packed, inorganic, mineral filler.

C. Finish Facings: Factory apply finish-facing materials with appropriate backings, using mildew-resistant nonstaining adhesive as recommended by finish-material manufacturer's written instructions.

1. Apply facing to panel in one piece, seamless, and with no gaps or overlaps; free of air bubbles, wrinkles, blisters, or other defects.

2. Tightly secure and conceal raw and selvage edges of facing for finished appearance.

3. Match facing pattern 72 inches above finished floor.
D. Wiring: Conceal conductors and cables in raceways. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

2.05 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.

2.06 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Examine components before installation. Reject components that are wet, moisture damaged, mold damaged, broken, cracked, chipped, deformed, or unmatched.

C. Examine roughing-in for electrical power to verify actual locations of power connections before partition installation.

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

3.02 INSTALLATION

A. Install demountable partitions after other finishing operations have been completed.

1. Install partitions rigid, level, plumb, and aligned. Install seals at connections with floors, ceilings, fixed walls, and abutting surfaces to prevent light and sound transmission.

2. Except for filler panels scribed to fixed walls or columns, do not modify manufacturer's standard components.
B. Suspended-Ceiling System: Make alterations to suspended-ceiling system required by partition installation or to gain access to electrical or communication systems without affecting the structural integrity of suspended-ceiling system. Make alterations so they are not noticeable after panel installation.

3.03 ERECTION TOLERANCES

A. Install each demountable partition so surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent partitions.

3.04 ADJUSTING

A. Inspect installation, correct misalignments, and tighten loose connections.

B. Remove and replace defaced or damaged components that cannot be satisfactorily repaired.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, assemble, disassemble, and maintain demountable partitions.

END OF SECTION
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SECTION 10 22 26

FOLDING PANEL PARTITIONS

PART 1  GENERAL

1.01  WORK INCLUDED

A. Provide sound insulated, manually operated, folding, flat panel operable walls as indicated, complete including required fasteners, fittings and accessories.

1.02  RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. Miscellaneous Metals (overhead framing): Section 05 50 00.

1.03  QUALITY ASSURANCE

A. Manufacturer's Qualifications: The Manufacturer shall have successful experience in the fabrication and installation of sound rated operable partition assemblies, including no less than 5 years’ experience in the fabrication and installation of assemblies equal to the size and complexity of this work. Upon request, the manufacturer shall provide references and acoustical test reports for three similar recently completed projects.

B. Installer qualifications: Sound rated operable partition assemblies must be installed by manufacturer, manufacturer’s authorized distributor or an installer qualified in the installation and maintenance of specified equipment as approved by manufacturer.

C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.

1.04  SUBMITTALS

A. Product Data: Submit Manufacturer’s specifications and other data needed to prove compliance with all specified requirements. Product data to include: material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable panel partition, component, and accessory specified. Include data on acoustical performance, surface-burning characteristics, and durability.

B. Installation Instructions: Submit Manufacturer’s recommended installation instructions and procedures.
C. Shop Drawings: Show location and extent of operable panel partitions. Include plans, elevations, sections, details, attachments to other construction and accessories. Indicate dimensions; weights; conditions at openings and for storage; and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, and direction of travel. Show blocking to be provided by others.

D. Product Certificates: Submit letter signed by manufacturer certifying that operable walls to be furnished on this project comply with the requirements of the specification.

E. Operation and Maintenance Data: For the following to include in maintenance manuals specified in Section 01 78 23:
   1. Panel finishes and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
   2. Seals, hardware, track, carriers, and other operating components.

F. Acoustical Laboratory Test Reports: Submit Manufacturer’s STC values for each of the specified operable partitions. Sound transmission loss and STC values shall be based on measurements conducted by a laboratory accredited for specific acoustical testing under the National Voluntary Laboratory Accreditation Program (NVLAP) and in accordance with ASTM E90.

1.05 ACOUSTICAL PERFORMANCE REQUIREMENTS

A. Provide operable partition assemblies (including pass doors, seals, etc) that provide a minimum Sound Transmission Class (STC) of 50 and Noise Isolation Class (NIC) of 42. Sound transmission loss and STC values shall be based on laboratory acoustical testing, which is performed by a National Voluntary Laboratory Accreditation Program (NVLAP) approved testing laboratory. Testing shall be performed in accordance with ATSM E90. NIC values shall be based on field acoustical testing performed by a qualified acoustical consultant who has a minimum of 5-years’ experience in sound isolation measurements.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect products during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the requirements of the manufacturer’s instructions for storage and handling.

B. Deliver materials in order as required by schedule for installation.

C. Handle materials in accordance with manufacturer's instructions.
1.07 PROJECT CONDITIONS

A. Field Measurements: Verify operable panel partition openings and storage arrangements by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.08 WARRANTY

A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.

B. Partition Warranty period: Two (2) years.

C. Suspension System Warranty: Five (5) years.

PART 2 PRODUCTS

2.01 FOLDING PARTITIONS

A. Manufacturer: Drawings and specifications are based on MODERNFOLD Acoustic-Seal 932. Subject to compliance with the specified requirements, products by EMCO; HUFCOR; KWIK-WALL, PANELFOLD and MODERCO INC. are acceptable.

B. Operation: Consists of a series of two panel hinged pair groupings, manually operated, flat steel panels, top supported with operable floor seals.

1. Final closure accomplished by expanding jamb from panel edge or hinged panel as required by each door condition (i.e. partitions with pocket doors require expanding jamb).

C. Panel Construction

1. Size: 3 inches thick in manufacturer's standard widths.
3. Core (Frame): 16 gage steel.
4. Top Channel Assembly: Reinforced to support suspension components.
5. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.
6. Weight: Approximately 10 pounds per square foot.

D. Panel Finish: Factory applied, Class 1 rated material, as per IBC with flame spread 0-25 as determined by ASTM E84.

1. Provide reinforced vinyl with woven backing weighing not less than 30 ounces per linear yard. Color and pattern as selected by Architect.

E. Sound Seals
2. Horizontal Top Seals: Continuous contact extruded vinyl.
3. Bottom Seals: Automatic operable seals providing nominal 2-inch operating clearance with an operating range of +0.50-inch to -1.50-inch which automatically drop as panels are positioned, without the need for tools or cranks.

F. Suspension System: Continuous "C" channel shape steel track, supported by adjustable steel brackets connected to structural supports with threaded rods.

1. Panels supported by ball-bearing, steel wheel trolley assemblies.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that openings have been completely prepared in accordance with manufacturer's requirements. Notify Architect of conditions detrimental to operable wall installation and operation.

3.02 INSTALLATION

A. General: Comply with ASTM E557, operable panel partition manufacturer's written installation instructions, Drawings, and approved Shop Drawings.

B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.

END OF SECTION
SECTION 10 28 13

TOILET ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. This section covers all toilet accessories. Extent of each type of accessory is indicated on the drawing and specified herein.

B. Included are accessories for:

1. Toilet rooms.
2. Locker/Shower rooms.
4. Kitchens, Break Rooms and similar areas with sinks.

C. Coordinate toilet partition mounted items with partition manufacturer for proper fastener reinforcements.

1.02 QUALITY ASSURANCE

A. Provide each type of products of one manufacturer. Provide locks with same keying for all accessory units in the project.

B. Stamped names or labels on exposed faces of units not permitted.

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of toilet accessory required.

1.04 DELIVERY, STORAGE AND HANDLING

A. Delivery accessory items in manufacturer's original, unopened packaging.

B. Store and handle materials in accordance with manufacturer's recommendations. Protect against soiling, damage and wetting.

1.05 PROJECT CONDITIONS

A. Furnish anchoring devices and inserts for installation of toilet accessories. Coordinate delivery of items which must be set or built into other work.

B. Provide setting drawings, templates and instructions for installation of anchorage devices.
1.07 WARRANTY

A. Submit mirror manufacturer’s written ten year warranty against silver spoilage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Where a manufacturer’s product is specified as a Basis of Design, equal products as manufactured by BOBRICK, BRADLEY, AJW, AMERICAN SPECIALTIES, may be used provided the product meets the requirements of the specifications, unless otherwise indicated.

2.02 ITEMS


1. Toilet Partition Mounted (Serves two compartments): BRADLEY Model 5422.
3. Cabinet: Hinged 22 gauge stainless steel with tumbler lock.
4. Capacity: Two standard core toilet tissue rolls through 5" in diameter.

B. Soap Dispenser - Horizontal Tank Type: BRADLEY Model 6542

1. Type: Surface mounted, liquid dispenser.

C. Soap Dish: BRADLEY Model 900.

1. Material: Stainless Steel, 7 ga., type 304.
2. Finish: Satin.

D. Handicap Bars: BRADLEY Series 812

1. Diameter: 1-1/2 inch.
3. Fasteners: Concealed.
4. Style and Length
   a. As indicated; where not indicated provide 42” long horizontal and 18” vertical bars.
   b. Provide both horizontal and vertical bars in conformance with ANSI A117.1, 604, 608 and 609.

E. Paper Towel Dispenser: BRADLEY Model 250-15

1. Type: Surface mount with lockable hinged front cover.
2. Capacity: 500 multi or 300 C-fold towels.

   1. Type: Recessed with lockable hinged covers.
   3. Capacities
      a. Dispenser: 800 multi-fold; 500 C-fold.
      b. Waste Receptacle: 4.2 gallon.

   1. Type: Surface mounted on toilet partition. Hinged bottom for disposable liner removal.

H. Sanitary Napkin/Tampon Dispenser: BRADLEY Model 4017.
   1. Type: Recessed, coin operated (25 cent operation).
   3. Capacities

I. Robe/Towel Hook: BRADLEY Model 9119-81
   1. Type: Wall mounted, concealed fastener.

J. Mirrors
   1. Standard Framed Type: BRADLEY Model 780.
      a. Frame: Stainless steel angle, theft resistant concealed fasteners.
      b. Glass: Float 1/4" thick with full silver coating, copper coating and organic coating. Warranted by manufacturer 10 years against silver spoilage.
      c. Sizes: As indicated.
   2. Unframed Type: Section 08 81 00.

K. Mop Strip: BRADLEY Model 9953.
   1. Description: Stainless steel, satin finish back plate with three spring activated rubber cam mop holders.
   2. Location: Provide at each janitors sink. Coordinate height with Architect.

L. Shower Curtain and Hooks: BRADLEY Models 9533 and 9536:
1. Provide 6 gauge, 100% vinyl material with hemmed edges and rust proof grommets. Field verify for height and width.
3. Provide quantity of hooks as required.

M. Shower Curtain Rod: BRADLEY Model 9539
   1. Description: Type 304, 18 gauge stainless steel.
   2. Diameter: 1-1/4”.
   3. Length: Field verify.
   4. Provide with mounting flanges and escutcheons.

N. Shower/Drying Seat: BRADLEY Model 9569.
   1. Description: Folding type. Right or left hand as indicated or as required for field conditions.
   2. Frame: Stainless steel tubing, type 304, 18 gauge.
   3. Seat: Solid phenolic; color as selected by Architect.

2.03 FABRICATION
   A. Edges: All throat openings and similar type exposed edges of towel dispensers, seat cover dispensers, waste receptacles and similar type accessories to be hemmed or sufficiently rounded to preclude accidental cuts to users.
   B. Miters: Provide one-piece seamless beveled or return flange; open miters, if not welded, must be worked to eliminate sharp edges; edges which may cut or snag are not acceptable.

2.04 SCHEDULE OF ACCESSORIES
   A. Location, quantity and mounting height of accessories as indicated on drawings.
   B. Keyed Units: Key all similar types of units alike. Provide two keys per unit.

PART 3 EXECUTION

3.01 INSPECTION
   A. Installer: Examine substrates, previously installed inserts anchorages necessary for mounting of accessories and other conditions under which installation is to occur.
      1. Notify Contractor in writing of conditions detrimental to proper and time completion of the work.
      2. Do not proceed with work until satisfactory conditions have been corrected.
3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions using fasteners which are appropriate for substrate and recommended by manufacturer of unit. Install units and plumb and level, firmly anchored in positions indicated.

B. Provide concealed fasteners wherever possible of types required for substrate conditions encountered.
   1. Metal Stud and Gypsum Board: Screws or bolts anchored to 16 gage (minimum) metal plate blocking or wood blocking located within stud space. See Section 09 21 16 or 06 10 50.
   2. Concrete Masonry Units: Integral fasteners (i.e. expansion anchors, etc.).

C. Lead, plastic or fiber plugs are not acceptable.

D. Grab Bars: Coordinate grab bar locations as to right hand or left hand installations with field conditions.
   1. Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F446.

E. Upon completion of installation, adjust each accessory unit for proper operation and clean exposed surfaces. Turn over keys to designated Owner's personnel.

END OF SECTION
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SECTION 10 44 00

FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide fire extinguishers and cabinets as shown and specified.

1. Provide fire extinguishers with wall brackets in non-finished areas (i.e. mechanical rooms, electrical rooms, etc.).

1.02 RELATED SECTIONS

A. Masonry (coordination for recessed cabinets): Section 04 22 00

1.03 QUALITY ASSURANCE

A. Provide fire extinguishers complying with Fire Protection Association (NFPA) Pamphlet No. 10.

B. Provide only new portable fire extinguishers fully loaded, tested and approved by Underwriter's Laboratories (UL), and ready for use.

C. Fire-Rated, Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

1.04 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. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Samples: Submit 6” x 6” sample for each type of exposed finish required.

1.05 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 recessed fire protection cabinets with wall depths.
1. Coordinate location of fire extinguisher cabinets prior to construction of concrete masonry walls. Verify recessed type installations and coordinate these locations with the masonry construction.
a. Provide mason with rough opening size of cabinets.

**PART 2 PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

A. Portable Fire Extinguishers
   1. AMEREX CORP.
   2. ANSUL INC.
   3. BUCKEYE FIRE EQUIPMENT COMPANY
   4. WALTER KIDDE, THE FIRE EXTINGUISHER CO.
   5. J. L. INDUSTRIES
   6. LARSEN'S MANUFACTURING COMPANY
   7. POTTER-ROEMER
   8. WATROUS

B. Fire Extinguisher Cabinets
   1. J.L. INDUSTRIES
   2. LARSEN'S MANUFACTURING COMPANY
   3. POTTER-ROEMER
   4. WATROUS
   5. THE WILLIAMS BROTHERS CORP.

B. Where a specific manufacturer's product is specified herein it is to establish a level of quality. Products by the other manufacturers listed are acceptable providing they meet these specifications.

2.02 FIRE EXTINGUISHERS

A. Multipurpose Dry-Chemical Type: Fabricate in accordance with NFPA No.10, 10A, and 10L and UL Standards, except hose, gauge face cover, and horn cone parts shall be metal. No plastic or nylon valves, trigger/handle, casing, or gauge will be acceptable. Fire extinguishers, unless indicated otherwise, shall be 10 lb. multi-purpose dry chemical type for use on A, B, and C fires (4A-60BC), with hose and horn.

B. Size: 21-1/2" high x 8-1/2” wide x 5” deep.

2.03 FIRE EXTINGUISHER CABINETS

A. Provide steel construction.

B. Basis of Design: Drawings and specifications are based on LARSEN Architectural Line with full glass door. LARSEN catalog numbers are listed to establish a standard of quality and mounting type.
Equal products may be provided from the listed acceptable manufacturers. Provide the following wall mounting types where a specific type of cabinet is indicated on the drawings. Where no type is indicated, provide recessed units.

2. Surface Mount - Steel: 2409-SM.
3. Semi-Recessed - Steel: 2409-6R.
6. Doors: Full glass

C. Coordinate final model size with fire extinguisher.

D. Finish: Baked enamel or powder-coat.


E. Mounting Brackets: Provide manufacturer's standard plated finish, heavy duty mounting brackets for surface mounted fire extinguishers. Provide proper size and type for capacity of extinguishers indicated.

F. Fire Rated Cabinets: Listed and labeled to meet requirements of ASTM E814 for fire resistance rating of wall where it is installed.

1. Construct fire rated cabinets with double walls fabricated from 0.0478 inch thick, cold rolled steel sheet lined with minimum 5/8 inch thick, fire barrier material.

G. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate the words "FIRE EXTINGUISHER" vertically on cabinet door.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

2.04 CABINET FABRICATION

A. Provide standard steel box with trim, frame, door and hardware to suit cabinet type, trim style and door indicated. Weld all joints and grind smooth; miter and weld door frames. Fabricate trim in one piece with corners mitered, welded and ground smooth. Open miters are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

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

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

3.02  INSTALLATION

A. Install fire extinguishers and fire extinguisher cabinets where indicated or as directed by Architect in accordance with manufacturer's instructions and recommendations. Mount at heights indicated, when not indicated as directed by Architect.

B. Securely anchor brackets and cabinets to substrate construction with toggle bolts or expansion anchors. Lead, wood or plastic plugs and fasteners are not acceptable.

C. Fire extinguishers are to be fully charged and ready for use when building is turned over to the Owner. Extinguishers shall be certified as fully charged by an approved fire extinguisher service company and shall be tagged or labeled as such.

3.03  ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. On completion of installation, clean interior and exterior surfaces as recommended by manufacturer.

C. 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.

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

E. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION
SECTION 10 51 13

METAL LOCKERS

PART 1  GENERAL

1.01  WORK INCLUDED

A. Provide metal lockers in arrangements, layouts and quantities indicated. Section also includes:

1. Pedestal benches.

B. Provide five (5) per cent of lockers as ADA compliant. Coordinate location with Architect. Location to be coordinated with locker design and placement of shelves.

1.02  RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

1.03  QUALITY ASSURANCE

A. Provide lockers as complete units produced by one manufacturer, including necessary mounting accessories, fittings and fastenings.

B. Contractor responsible for obtaining dimensions of locker space prior to manufacture and installation.

C. Reference Standards

1. American Society for Testing and Materials (ASTM)
   a. ASTM A366 “Commercial Quality (CS) Steel, Carbon, (0.15 Maximum Percent) Cold-Rolled”.
   b. ASTM A569 “Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial”.

2. Americans with Disabilities Act Accessibility Guidelines (ADA or ADAAG).

1.04  SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

B. Submit shop drawings indicating materials, sizes, layouts, accessories, color, numbering and methods of installation.

C. Submit color charts for color selection.
1.05 DELIVERY, STORAGE AND HANDLING

A. Do not deliver lockers until buildings are permanently enclosed and ready for locker installation.

B. Protect lockers from damage during delivery, storage, handling and installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: ASI, LYON METAL PRODUCTS, INC., PENCO, DeBOURGH, LIST INDUSTRIES, REPUBLIC.

2.02 MATERIALS AND COMPONENTS

A. Sheet Steel: ASTM A 1008, Class I, mild-annealed, cold-rolled steel, free from surface imperfections.

B. Expanded Metal: ¾” mesh flattened carbon steel.

C. Fasteners: Cadmium, zinc or nickel plated steel. Exposed heads slotless type. Provide self-locking nuts or lock washer for nuts on moving parts.

D. Hooks: Ball end, cadmium plated, forged steel.

E. Identification Plates: Provide each locker opening with aluminum number plate with approximately 3/8" high numerals. Rivet plate to door frame or door. Number lockers as directed by Architect.

2.03 SOLID DOOR TYPE LOCKERS

A. Lockers

1. Arrangement and Layouts: As indicated.

2. Sizes: As indicated.

B. Lockers shall have a "quiet" lock bar assembly. Moving parts within door shall be cushioned by rubber or other means to achieve maximum sound suppression.

C. Frames: Minimum 16 gage channels or 12 gage angles, with corners welded to form a rigid one-piece structure. Form door stops at vertical members.

D. Backs and Sides: Minimum 18 gage steel. Flange backs on vertical edges and sides where they enter member with backs, making double flanged rear corners. Provide all lockers with full back panels.

E. Tops and Bottoms: Minimum 18 gage steel, flanged edges.
F. Doors: Minimum 16 gage steel, flanged at all edges. Construct doors to prevent springing when opening and closing. Fabricate doors to swing 180 degrees. Provide louverless solid door fronts with door perimeter ventilation equal to vent area provided by standard door louvers. Provide rubber door silencers at latches.

1. Provide door arrangement as indicated.

G. Door Hinges: Heavy duty, not less than 0.050" thick steel, full loop, five knuckle, tight pin, minimum 2" high. Weld hinges to inside of frame and secure to door with minimum two factory installed fasteners, completely secured and tamperproof when locker door is closed.

H. Latching Device: Positive automatic type locking device of pre-locking type.

1. Locking - Padlock: Manufacturer's standard recessed handle type containing hole for padlock attachment.
2. ADA Compliant Lockers: Lever handle with opening function occurring with 30° or less rotation. Handle shall return to the locked position when released; turning lever will cause door to pop open and remain ajar. Locate approximately 34" above the floor.

I. Equipment: Provide one hat shelf approximately 9" below top of locker, one double prong back hook and one single prong wall hook on each side of each locker opening.

1. ADA Compliant Lockers: Provide shelf at a maximum of 54" above floor (where side access is permitted) or 48" above the floor (where front access only is permitted); provide additional shelf where bottom of locker is less than 9" above the floor.

J. Exposed Sides: Provide minimum 16 gage end panels.

K. Provide all required closures and trims. Minimum 16 gage.

L. Provide sloping locker tops in addition to the locker-section flat tops. Sloping tops must be continuous in length. Provide fillers or closures at the exposed end of sloping tops. Fabricate sloping tops from not less than 0.0478-inch thick steel sheet.

2.04 FABRICATION AND ACCESSORIES

A. Construction: Fabricate lockers square, rigid, without warp and with exposed metal faces flat and free of dents or distortions. Make all exposed metal edges safe to touch.

B. Solid Door Type: Weld frames together. Unless otherwise indicated, weld, bolt or rivet other joints and connections as standard with manufacturer.

C. Ventilated Type: All welded construction.
2.05 STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust and other contaminants that could impair paint bond.

B. Baked Enamel Finish: Immediately after cleaning and pre-treating, apply manufacturer’s standard baked-on enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer’s written instructions for applying and baking to achieve a minimum 1.4 mils dft on doors, frames and legs and 1.1 mils dft on other surfaces.

C. Colors: As selected by Architect. Paint interior the same color as exterior.

2.06 BENCHES

A. Description: Provide wood bench mounted on steel pipe pedestals, bolted to floor.

B. Size: 18" high x 9-1/2" wide x 1-1/4" thick x nominal length as indicated on drawings.

C. Top: Laminated maple, natural finish.

D. Manufacturer: Same as Locker Manufacturers listed in paragraph 2.01A herein.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install lockers in accordance with manufacturer's instructions. Install units plumb, rigid and level, located as indicated on drawings.

B. Apply fastenings through back up reinforcing plates where necessary to prevent metal distortion. Conceal fasteners whenever possible.

C. Install recessed locker trim. Provide flush hairline joint against adjacent surfaces. Install trim with concealed fasteners.

D. Touch-up marred finished, using materials as recommended or furnished by manufacturer. Replace units that cannot be satisfactorily repaired as directed by the Architect.

E. Adjust doors and latches to operate easily without binding. Verify satisfactory operation of integral locking devices.

3.02 ADJUSTING, CLEANING, AND PROTECTING

A. Clean, lubricate and adjust hardware, Adjust doors to operate easily without binding.
B. Protect lockers from damage, abuse, dust, dirt, stain or paint. Do not permit use during construction

END OF SECTION
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SECTION 10 75 00

FLAGPOLES

PART 1  GENERAL

1.01  WORK INCLUDED

A. Ground set tapered aluminum flagpoles with illuminated finial.

B. Accessories to complete the work.

1.02  RELATED SECTIONS

A. Cast-In-Place Concrete: Section 03 30 00.

B. Electrical: Division 26.

1.03  SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

B. Submit shop drawings showing general layout, base and complete anchoring and supporting system.

C. Submit sample of aluminum finish as required for the work.

D. Submit samples of stainless steel finish as required for the work.

1.04  QUALITY ASSURANCE

A. Provide flagpole as a complete unit, including fittings, accessories, base and anchorage devices.

B. Structural Performance: Provide flagpoles capable of withstanding the effects of wind loads as determined according to NAAMM FP 1001, “Guide Specifications for Design of Metal Flagpoles”, or to specified wind speed, whichever is more stringent.


D. Pole Construction: Construct pole and ship to site in one piece, if possible. If more than one piece is necessary, provide tight-fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight hairline field joints.
1.05 DELIVERY, STORAGE AND HANDLING

A. Spiral wrap flagpole with manufacturer's standard protective wrapping and prepare for shipment in fiber shipping tube or other approved protective container.

B. Deliver flagpole and accessories completely identified for installation procedure. Handle and store flagpole in accordance with manufacturer's recommendations to prevent damage, soiling or deterioration.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: AMERICAN FLAGPOLE; ADMIRAL FLAGPOLES; CONCORD INDUSTRIES; MORGAN FRANCIS; US FLAG AND FLAGPOLE SUPPLY

2.02 MATERIALS AND COMPONENTS

A. Flagpole: 30' exposed height, ground set embedded base, cone tapered flagpole fabricated from aluminum tubing (alloy 6063-T6), satin finish.

1. Overall total length to provide setting depth of not less than 10% of exposed length.
2. Butt Diameter: 6".
3. Top Diameter: 3-1/2".

B. Provide manufacturer's standard base system for the type of flagpole installation required.

1. Base: Spun aluminum flash collar, finish to match pole.
2. Foundation: Manufacturer's standard foundation tube fabricated from 16 gage corrugated steel tube with 3/16" thick steel base plate and support plate, 3/4" diameter x 18" long ground spike and steel centering wedges, all welded construction. Provide hardwood wedges at top for plumbing pole after erection. Hot-dip galvanize foundation after fabrication, including tube.
3. Concrete: Conform to Section 03 30 00.

C. Flagpole Fittings

1. Beacon/Halyard/Finial: Aluminum, 6" diameter, finish as selected by Architect. FLAGPOLE WAREHOUSE #ORN-322669. 110V.
2. Halyards: Conventional external type, #10 multi-filament continuous braided polypropylene, dyed to match pole finish with two bronze swivel snaphooks.
3. Cleats: Two, 9" cast aluminum, each attached with two 5/16" stainless steel screws.

D. Flag: 3' x 5'; provided by Owner.
PART 3  EXECUTION

3.01  INSTALLATION

A. Excavate for foundation concrete to neat clean lines in undisturbed or compacted soil. Provide forms when required due to unstable soil conditions. Remove wood, loose soil, rubbish, and other foreign matter from excavation, and dampen earth forms before placing concrete. See Division 31 for additional requirements.

B. Install flagpole in accordance with manufacturer's installation instructions and shop drawings.

1. Provide positive lightning ground.
2. Coat all portions of pole below grade with heavy coat of bituminous paint.
3. Place and cure foundation concrete in accordance with Section 03 30 00. Finish exposed concrete surfaces to smooth dense surface. Provide positive slope for water run-off to base perimeter.

END OF SECTION
SECTION 10 88 00

FLOOR SCALES

PART 1  GENERAL

1.01  SCOPE

A. Furnish and install recessed floor scale, frame and wall mounted display.

1.02  QUALITY ASSURANCE

A. Manufacturer: Regularly engaged in the business of manufacturing floor scales of the type and character required by these specifications.

B. Installer Qualifications: Minimum two years experience.

1.04  SUBMITTALS

A. Product Data: Submit manufacturer's product specifications and installation instructions for each principal component or product.

B. Shop Drawings: Submit Template drawings.

PART 2  PRODUCTS

2.01  FLOOR SCALE

A. Scales

1. Type: Recessed.
2. Capacity: 10,000 LB, approved for commercial use.
3. Size: 5 x 7 feet platform size.
5. Manufacturers/Models: Subject to requirements, provide one of the following:
   a. METTLER TOLEDO SCALE Model 2158 Vertex.
   b. FAIRBANKS Aegis Profile Series.
   c. THURMAN SCALE COMPANY Avenger Series.

B. Recessed Frames

1. Type: Shallow pit design steel foundation capable of being used as concrete pouring form.
2. Manufacturers/Models: Subject to requirements, provide one of the following:
   a. METTLER TOLEDO SCALE, Model No. 2158 Quick-Pit.
   b. FAIRBANKS "ACC-1610."
c. THURMAN SCALE COMPANY.

C. Displays: Wall mounted, digital display indicators complete with cable.

1. Manufacturers/Models: Subject to requirements, provide one of the following:
   a. METTLER TOLEDO SCALE, Panther Plus Scale Terminal.
   b. FAIRBANKS Model H92-5200.
   c. THURMAN SCALE COMPANY Model 465.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in strict accordance with manufacturer's written instructions and recommendations.

B. Coordinate floor recess and frame installation with concrete slab placement.

3.02 CLEAN-UP

A. Remove all unused materials and leave all areas and surfaces clean.

END OF SECTION
SECTION 11 13 00
LOADING DOCK EQUIPMENT

PART 1  GENERAL

1.01  WORK INCLUDED

A. Provide dock equipment as shown and specified. Work includes:
   1. Dock levelers with bumper pads
   2. Automatic truck restraint system

1.02  RELATED SECTIONS

A. Embedded Steel Angles: Section 05 50 00.

B. Conduit and Wiring: Division 26. Except wiring from power units to levelers and controls.

1.03  QUALITY ASSURANCE

A. Provide dock leveler as complete unit produced by a single manufacturer, including necessary accessories, controls, control wiring, fittings and anchorages.

B. Installer: Must be approved by manufacturer of dock equipment and have minimum 3 years experience in installing type of equipment required.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. 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.

1.04  SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for loading dock equipment. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Submit for fabrication and erection of loading dock equipment. Include the following:
1. Plans, elevations and large scale details.
2. Detailed drawings and requirements for pit construction and dimensions.
3. Anchorages and accessory items.
4. Provide location template drawings for items supported or anchored to permanent construction.
5. Rough-in drawings for electrical service where required, well in advance of concrete work.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency; indicate compliance of dock levelers with requirements in MH 30.1 for determining rated capacity, which is based on comprehensive testing within last two years of current products.

1. Submittal Form: According to MH 30.1, Appendix A.

D. Maintenance Data: Submit manufacturer's maintenance and service data, including address and telephone number of nearest authorized service representative.

PART 2 PRODUCTS

2.01 DOCK LEVELER AND VEHICLE RESTRAINT

A. Dock Levelers

   a. Dock leveler shall be complete package unit providing integral adjustable locking type maintenance strut, full operating range, to stop and support up to full rated load on unsupported dock leveler, and to allow lowering of dock leveler below dock level without extending lip.
   b. Lip shall extend minimum of 1 foot beyond bumpers.
2. Capacity: 25,000 LBS minimum; duty range 1.
3. Size: 8 feet long x 7 feet wide.
4. Operating/Service/Working Range: 2 feet; 1 foot above and 1 foot below dock.
5. Heavy duty dock bumpers with "J" bolts.
6. Dock leveler control box: All individual components, as well as the complete box unit, shall be UL-approved.
7. Motor (Hydraulic) Operation
   a. Electrical power pack (includes motor, pump and valve assembly) of 1 HP, 208/230 volt, 3 phase motor.
   b. Control Panel: Heavy duty, single push-button activation.
   c. Platform operated by single hydraulic cylinder.
8. Required Optional Features (Accessories):
a. RHR-600 Dok-Lok Vehicle Restraint System complete with Universal Controls, signs and 2-year parts and labor warranty.

b. Abrasive, skid-resistant ramp and lip surface.

c. Black and yellow striped toe guards.

9. Approved Products: The first product listed is the Basis of Design. Subject to compliance with requirements of the Basis of Design, the following products are also acceptable:

a. RITE-HITE CORPORATION, RHH Series (with Dok-Lock vehicle restraint system).

b. KELLEY, HP Series (with Star vehicle restraint system).

c. W. B. MCGUIRE COMPANY, HP Series (with Hold-Tite vehicle restraint system).

**PART 3 EXECUTION**

3.01 PREPARATION

A. Coordinate and furnish anchorages with templates, diagrams and instructions for their installations, for loading dock equipment indicated to be attached to or recessed into concrete or masonry constructions. Coordinate delivery of these items to project site.

3.02 INSTALLATION

A. General: Comply with manufacturer's detailed instructions in installing loading dock equipment.

B. Dock Levelers: Attach equipment to platform construction to comply with manufacturer's directions.

C. Dock Bumpers: Bolt to walls where indicated, weld to angles where applicable. Provide two at each dock leveler.

D. Automatic Truck Restraint System: Provide one at each dock leveler.

**END OF SECTION**
SECTION 11 31 00

RESIDENTIAL APPLIANCES

PART 1  GENERAL

1.01  WORK INCLUDED

A. Provide appliances where indicated on drawings consisting of:

1. Range/oven
2. Microwave
3. Washer
4. Dryer
5. Griddle
6. Equipment Stand

1.02  RELATED SECTIONS

A. Electrical Rough-In:  Included under Electrical Contract, Division 26.

B. Plumbing Work:  Division 22.

1.03  SUBMITTALS

A. Manufacturer's Product Data:  Submit for all items.

PART 2  PRODUCTS

2.01  ITEMS

A. Manufacturers listed are to establish a standard of acceptable quality.  Except where no substitution is indicated, equal or similar products as approved by the Architect by other manufacturers as follows are acceptable:

1. KENMORE
2. KITCHEN AID
3. AMANA
4. GENERAL ELECTRIC
5. MAYTAG
6. FRIGIDAIRE
7. THERMADOR

B. Range/Oven:  GENERAL ELECTRIC, Model No.  JB450RK, 30" wide, free standing electric range

1. Capacity:  5.0 cu. ft. oven
2. Self-clean oven
3. Removable full-width storage drawer
4. Finish: Stainless steel

C. Microwave: GENERAL ELECTRIC, Model No. PVM9215SKSS, 30” wide; over the range type.
   1. Capacity: 2.1 CF
   2. Watts: 1000.
   3. Vent: 400CFM; upfront charcoal filter with light indicating when filter needs to be replaced.
   4. Finish: Stainless steel

D. Dryer: MAYTAG Maxima MED6000XG 7.4 cu. ft. Cosmetallic Electric Dryer

E. Washer: MAYTAG Maxima MHW6000XG High-Efficiency 5 cu. ft. Cosmetallic Front Load.

F. Griddle: VOLLRATH Cayenne FTA8024 24” Electric

G. Equipment Stand: VOLLRATH Item # 40740 24” x 24” Stainless steel

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all items in accordance with manufacturer’s instructions.

B. Provide all required accessories, cords and fasteners to ensure a complete installation.

END OF SECTION
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PART 1 GENERAL

1.01 SUMMARY

A. Provide ice making equipment comprised of ice cubers, remote condensers and ice storage bins. Provide units as complete operating systems.

1.02 RELATED SECTIONS

A. Plumbing: Division 22.

B. Electrical: Division 26.

1.03 SUBMITTALS

A. Product Data: Submit for all items.

B. Operation and Maintenance Data: Submit for all items.

1.04 DELIVERY, STORAGE AND HANDLING

A. Conform to manufacturer’s requirements.

B. Time deliveries to ensure materials are available on site when required.

C. Materials delivered to site in Manufacturer’s clearly identified containers.

D. Receive and store materials in their original containers in a secured space, and in a manner to prevent damage from exposure to harmful weather or conditions.

1.05 COORDINATION

A. Coordinate with rough-ins for water piping and electrical wiring.

1.06 WARRANTY

A. Provide manufacturer’s warranty for the following periods:

1. Entire Machine: 3-Year parts & labor
2. Evaporator: 5-Year parts & labor
PART 2  PRODUCTS

2.01  MANUFACTURERS
   A.  Basis of Design:  Manufacturers listed below.  No substitutions.

2.02  EQUIPMENT DESCRIPTIONS
   A.  Quantity:  Four (4) units
   B.  Ice Cuber:  Hoshizaki Model No. KM-901MRH
      1.  Stainless steel
      2.  889-lb. capacity/24-hours
      3.  R-404A refrigerant
      4.  208-230v/60/1-ph
   C.  Remote Condenser:  Hoshizaki Model No. URC-9F with R404-3568-2 35'
       Pre-Charged Tubing Kit
      1.  R-404A refrigerant
      2.  115v/60/1
   D.  Ice Bin:  MGR Equipment Model No. SP-900-34-SS
      1.  950 lbs. bin storage capacity
      2.  Stainless steel interior and exterior

PART 3  EXECUTION

3.01  EXAMINATION
   A.  Verify that all plumbing and electrical rough-ins are located in the appropriate
       location.

3.02  INSTALLATION
   A.  Install equipment and accessories in accordance with manufacturer’s installation
       instructions.  Ensure that equipment is securely attached to adjacent
       construction.

3.02  CLEANING AND PROTECTION
   A.  Clean exposed surfaces of equipment.  Comply with manufacturer’s written
       instructions and recommendations for cleaning.
   B.  Protect equipment until final inspection and acceptance.

END OF SECTION
SECTION 11 53 56

STAINLESS STEEL COUNTERTOPS

PART 1  GENERAL

1.01  WORK INCLUDED

A. Work includes furnishing all labor, materials and appliances necessary to fabricate the items specified herein and indicated on the drawings, delivering all items, transporting, uncrating, assembling and placing each item in the position shown on plan, leveled and securely fixed in place.

1.02  SUBMITTALS

A. Shop Drawings

1. Plans, showing detailed dimensions for each item to a scale of 3/8” equals 1'-0".
2. Dimensioned construction drawings, indicating reinforcement and anchorage and other work required for completion and installation of equipment under this Section to a scale of 3/4" equals 1'-0".

1.04  QUALITY ASSURANCE

A. Standards: The following are referenced herein:

1. NSF: National Sanitation Foundation.
2. ASME: American Society of Mechanical Engineers.

PART 2  PRODUCTS

2.01  MATERIALS

A. Stainless Steel (Sheets): Type 302, 18-8 Series, consisting of from 17% to 19% chrome, 7% to 10% nickel and a maximum carbon content of 0.09.

1. Gage: 14 gage, unless otherwise indicated.
2. Provide all exposed surfaces with No. 4 mill finish.
3. Unexposed surfaces: Ground smooth with either a #80 grit finish or a first cut commercial finish.

B. Reinforcing Channels: 14 gage stainless steel construction, 1" x 4" x 1" edges ground and polished.
C. Sound Deadening: Apply 2" wide x 1/8" thick aluminum pressure sensitive soundproofing tape with acrylic adhesive and liner, to underside of countertop, spaced at 8" on center.

2.02 FABRICATION - GENERAL

A. Dimensions and Layout: As indicated.

B. Welding

1. Use electric fusion metal arc method. Carbon arc and gas welding will not be permitted. Provide welds continuous, strong, and ductile, with excess metal ground off and joint finished smooth to match adjoining surfaces.

2. Factory fabricate tops to reduce field joints to a minimum. Provide field joints welded, with exposed welds ground smooth and polished to match factory finish. Wherever material has been depressed by a welding operation, such depressions shall be suitably hammered and peened flush with the adjoining surface and, if necessary, be ground again to eliminate low spots.

3. Exercise care in all grinding operations. Wherever such break bends occur, they shall be free from undue extrusion and shall not be flaky, scaly and cracked in appearance. Where such breaks mar the uniform surface appearance of the materials, all such marks shall be removed. Sheared edges shall be free from burrs, fins and irregular; projections, and shall be finished to obviate all danger of cutting and lacerations when the hand is drawn over the edges. Weld miters and bullnoses.

C. Underside of Tops: Treat underside of tops with an aluminum spray finish. Apply sound deadening after tops have been completely fabricated.

D. Protective Coatings: Provide coverings for protection of equipment and maintain until acceptance of equipment.

E. Field Conditions: Where mechanical or structural field conditions have direct cause to alter equipment specified, in any manner, notify the Associate Architect for directional purposes before proceeding with that portion of the work.

PART 3 EXECUTION

3.01 PREPARATION

A. Field Measurements: Verify all measurements prior to fabrication of countertop.

B. Field Adjustments: Do all cutting, fitting, scribing, leveling and other work necessary to leave countertop in final position, ready for operation.

3.02 INSTALLATION

A. Install countertop plumb, level, true and straight with no distortion. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level.
1. Seal all items abutting walls or other permanent vertical surfaces with clear silicone sealant. See Section 07 90 20.
2. Where necessary, provide scribing or filler strips matching metal. Seal against wall as specified hereinabove.
3. Anchor tops to counter frames on 2'-6" centers.
4. Where tops exceed length of available sheets and where building access does not permit the top to be fabricated in one piece, provide field joints in tops welded, ground smooth and polished.

B. Provide work level, true to alignment, accurately fit to wall conditions and securely fastened to base units and other support systems as indicated.

C. Coordinate installation to permit other trades to make necessary measurements for connection of service lines and installation of sink and plumbing fixtures.

3.03 PROTECTION OF WORK

A. Until acceptance of work by the Owner, cover and protect the exposed surfaces in a manner that shall preclude injury to the finish

END OF SECTION
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PART 1  GENERAL

1.01  SCOPE OF WORK

A. Provide and install materials, and all related accessories required for complete mini-blind installation on all windows indicated on drawings to receive blinds.

1.02  WORK SPECIFIED IN OTHER SECTIONS

A. Wood Blocking: Section 06 10 50

1.03  REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Corded Window Covering Products; Window Covering Manufacturers Association. (ANSI/WCMA A101.1)

1.04  SUBMITTALS

A. Product Data: Provide data indicating physical and dimensional characteristics and operating features.

B. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

C. Samples: Submit two samples, minimum 18 inch long illustrating slat materials and finish, color, cord type and color.

1.05  PROJECT CONDITIONS

A. Coordinate the work with window installation and placement of concealed blocking to support blinds.

B. Store, handle, protect and install blinds in accordance with the manufacturer’s instructions and recommendations.

C. Take field measurements to determine sizes required.

PART 2  PRODUCTS

2.01  MANUFACTURERS

A. Subject to compliance with the specified requirements, provide one of the following:
1. HUNTER DOUGLAS; Model CD80.
2. LEVOLOR CONTRACT; Model Riviera Classic DustGuard.
3. GRABER (SPRINGS WINDOW FASHIONS); Model Bali Classic Custom Mini Blind Series 3000.

2.02 BLINDS AND COMPONENTS

A. Materials Blinds: Horizontal slat louvers hung from full-width headrail with full width bottom rail; manual control of raising and lowering by cord with full range locking; blade angle adjustable by control wand; complying with WCMA A100.1.

B. Metal Slats: Spring tempered prefinished aluminum; radiused slat corners, with manufacturing burrs removed.
   1. Width: 1”.
   2. Thickness: Minimum 0.08”.
   3. Colors: As selected.

C. Slat Support: Woven polypropylene cord, ladder configuration.

D. Head Rail: Prefinished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats

E. Bottom Rail: Prefinished, formed aluminum with top side shaped to match slat curvature; with end caps. Color: Same as headrail.

F. Lift Cord: Braided nylon; continuous loop.
   1. Free end weighted.
   2. Color: As selected.

G. Control Wand: Extruded solid plastic; hexagonal shape.
   1. Non-removable type.
   2. Length of window opening height less 3 inches.

H. Headrail Attachment: Wall brackets.

I. Accessory Hardware: Type recommended by blind manufacturer.

2.03 FABRICATION

A. Fabricate blinds to fit within openings with uniform edge clearance of 3/8 inch.

B. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/4” between blinds, located at window mullion centers.
PART 3  EXECUTION

3.01  INSTALLATION

A. Install blinds in accordance with manufacturer's instructions and recommendations.

B. Tolerances

1. Maximum Variation of Gap at Window Opening Perimeter: ¼”.
2. Maximum Offset From Level: 1/8”.

C. Replace any bent or damaged slats or other defective items prior to installation.

D. Install level and of proper length and width to fit all windows designated to be treated.

E. Adjust for smooth operation.

F. Clean blind surfaces just prior to occupancy.

END OF SECTION
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SECTION 12 93 13

BICYCLE RACKS

PART 1  GENERAL

1.0  SECTION INCLUDES

A. Bicycle Rack.

1.1  SUBMITTALS

A. Product Data: Submit manufacturer’s product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.
B. Shop Drawings: Submit manufacturer’s shop drawings, including plans and elevations, indicating overall dimensions.
C. Samples: Submit manufacturer’s samples of materials, finishes, and colors.
D. Warranty: Manufacturer’s standard warranty.

1.2  QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Manufacturer regularly engaged in manufacture of site furnishings since 1969.
B. Product Support: Products are supported with complete engineering drawings and design patents.
C. Base Worth: An installed base of products worth in excess of one hundred million dollars.
D. Assets: Excess of twenty million dollars in assets.
E. Production: Orders are filled within a 40-day schedule.
F. Facility Operator: Welders and machine operators are certified.

1.3  DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
B. Storage: Store materials in clean, dry area in accordance with manufacturer’s instructions. Keep materials in manufacturer’s original, unopened containers and packaging until installation.
C. Handling: Protect materials and finish during handling and installation to prevent damage.

1.4  WARRANTY

A. Warranty Information:
-Products will be free from defects in material and/or workmanship for a period of three years from the date of invoice.
- The warranty does not apply to damage resulting from accident, alteration, misuse, tampering, negligence, or abuse.
- Landscape Forms, Inc. shall, at its option, repair, replace, or refund the purchase price of any items found defective upon inspection by an authorized Landscape Forms service representative.
- Purchasers should be aware that normal use of these high quality products can result in superficial damage affecting the finish. Scratches, nicks, and dents are to be considered normal wear and tear, and are not the responsibility of the manufacturer.

PART 2  PRODUCTS

2.1 MANUFACTURER

A. Landscape Forms, Inc., 431 Lawndale Avenue, Kalamazoo, Michigan 49048. Toll Free (800) 521-2546. Phone (269) 381-0396. Fax (269) 381-3455. Website www.landscapeforms.com. E-mail: specify@landscapeforms.com.

2.2 BICYCLE RACKS

A. “Key” Bicycle Rack
B. Size:
   - Depth: 2-3/4 inches.
   - Height: 31-1/2 inches.
   - Width: 22-1/2 inches.
C. Mounting: Embedded

2.3 MATERIALS

A. Constructed of high density polyurethane plastic molded over electro-coated ASTM A513 carbon steel tubing. Base is cast aluminum
   1. Outside Diameter: 1.18 inches.
   2. Wall Thickness: 0.079 inches.

2.4 RECYCLED CONTENT

A. Polyurethane Rack:
   - Recycled Material Content: Minimum 43 percent.
   - Post-Consumer Material Content: Minimum 28 percent.
   - Pre-Consumer Material Content: Minimum 15 percent.
   - Recyclable: 100 percent.

2.5 FABRICATION

A. Shop assembled bicycle rack.
2.6 FINISHES
   A. Polyurethane Plastic: Polyurethane plastic molded over electro-coated finish on internal steel tubing. Aluminum base cover is finished in powder coat paint.

       1) Color-Grey

PART 3 EXECUTION

3.1 EXAMINATION
   A. Examine areas to receive racks.
   B. Notify Architect of conditions that would adversely affect installation or subsequent use.
   C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION
   A. Install in accordance with manufacturer’s instructions at locations indicated on the Drawings.
   B. Install level.
   C. Anchor securely in place.

3.3 ADJUSTING
   A. Finish Damage: Repair minor damages to finish in accordance with manufacturer’s instructions and as approved by Architect.
   B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect

3.4 CLEANING
   A. Clean rack promptly after installation in accordance with manufacturer’s instructions.
   B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION
   A. Protect installed racks to ensure that, except for normal weathering, racks will be without damage or deterioration at time of Substantial Completion.

END OF SECTION
SECTION 13 34 19

PRE-ENGINEERED METAL BUILDING FRAME

PART 1  GENERAL

1.01  REFERENCE DOCUMENTS

A. The Drawings and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to work specified in this Section. Also refer to General Notes on Drawings for “Pre-Engineered Metal Building Frame and Roof Purlin” notes.

1.02  DESCRIPTION OF WORK

A. Pre-engineered metal building system consisting of the following:

1. Shop fabricated structural steel rigid framed building.
2. Primary and secondary framing members.
3. Accessories.
4. Anchor bolts.

1.03  RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Testing Laboratory Services: Section 01 45 29.
B. Cast-in-Place Concrete: Section 03 30 00.
C. Structural Steel: Section 05 12 00.
D. Metal building curbs, gutters, downspouts and flashings: Section 05 50 00.
E. Sealants: Section 07 92 00.
F. Insulation: Section 07 21 00.
G. Hollow Metal Doors and Frames: Section 08 11 13.
H. Finish Hardware: Section 08 71 00.

1.04  REFERENCE STANDARDS

A. AISC - Specifications for Structural Steel Buildings.
B. AISI - Specifications for the Design of Cold-Formed Steel Structural Members.
C. AISI - Specifications for Design of Light-Gauge Steel Diaphragms.
D. American Society for Testing Materials (ASTM):
   1. ASTM A 36 - Structural Steel.
2. ASTM A 53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
3. ASTM A 123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
5. ASTM A 325 - High-strength Bolts for Structural Steel Joints, including Suitable Nuts and Plain Hardened Washers.
6. ASTM A 446 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-dip Process, Structural Quality.
7. ASTM A 529 - Structural Steel with 42 ksi (290 MPa) Minimum Yield Point (1/2" Maximum Thickness).
8. ASTM A 570 - Steel, Sheet and Strip, Carbon, Hot-rolled, Structural Quality.

E. AWS D1.1 - Structural Welding Code - Steel.


H. Steel Structure Painting Council (SSPC):


1.05 SYSTEM DESCRIPTION

A. Design Concept:
   1. Contractor (manufacturer) is responsible, and shall be "Engineer of Record" for structural engineering of work covered by this section.
   2. Architect will perform a cursory review of Contractor’s structural design for conformance to overall design concept only.
   3. Maintain design concept shown without altering profiles, finishes, and alignments. Make modifications from what’s shown only to meet performance requirements and coordinate work.

B. System:
   1. Primary framing: Transverse rigid frames, beams, columns, canopy
beams, intermediate columns, bearing end frames, end-wall columns, and wind bracing.

2. Secondary framing: Purlins, girts, eave struts, flange bracing, opening framing, sill support, clips, and other miscellaneous structural parts.

3. Building width and length: Measured from inside-to-inside face of wall covering, unless shown otherwise.

4. Eave height: Measured from finished floor to intersection of lines representing inside of wall covering and inside of roof covering, unless shown otherwise.

C. Design Criteria:

1. Structural framing: Design primary and secondary structural members in accordance with Metal Building Manufacturer's Association (MBMA) "Low Rise Building Systems Manual" as a minimum, except as follows:
   a. Where more stringent requirements are specified in this Section or on Drawings.
   b. Calculate wind pressures and lateral drift as specified.

2. Structural steel: Design members in accordance with AISC "Specifications for Structural Steel Buildings" for design requirements and allowable stresses. Design primary structural frames as pinned-base frames. Limit lateral drift of primary frames as defined in this Section. Live load deflections limited to L/240.

3. Light-gauge steel: Design members in accordance with AISI "Specification for Design of Cold-Formed Steel Structural Members" and "Specification for the Design of Light-Gauge Steel Diaphragms" for design requirements and allowable stresses. Live load deflections limited to L/240.

4. Welded connections: AWS D1.1, for welding procedures.


6. Anchor bolts: Design to resist horizontal and uplift reactions at column bases, in accordance with 2009 IBC Sections 1911 and 1912. Minimum length of bolt, anchorage, and bolt projection as shown on Drawings. Anchor bolt to be A307 with standard hex heads or A36 threaded rods with standard nuts on bottom with threads fully engaged. J-bolts not allowed.

D. Design Loads:

1. As noted on Drawings.

2. Roof live load:
   a. Minimum roof live loads shall be determined in accordance with IBC Section 1607.11.2.
   b. Roof covering: 50 psf or 200 pounds concentrated load located at center of maximum roof panel span.

3. Snow loads: As scheduled on Drawings.

4. Dead load: Withstand weight of pre-engineered metal building system.

5. Collateral load: Withstand weight of additional imposed loads of electrical components, ceiling, and other elements.
   a. Electrical: 5 psf and concentrated loads in excess of 200 pounds.
b. Ceiling: Where ceilings are scheduled, determine loads based upon ceiling materials used, 3 psf minimum.

c. Additional Loads: Refer to Drawings.

6. Thermal load: Withstand movement caused by an ambient temperature range of 120° F. (66° C.) and a surface temperature range of 160° F. (90° C.).

7. Special loads: Provide support beams in addition to roof purlins to support loads greater than 500 pounds.

E. Wind Design:

1. For design of primary members, as well as for wall and roof elements and components, calculate wind pressures based upon wind speed scheduled on Drawings, in accordance with 2012 IBC Section 1609.

2. Wind pressures shall not be arbitrarily reduced for purposes of calculating column base reactions. Allowable stresses for anchor bolt design may be increased in accordance with the Building Code.

3. Wind loads used in the design of the main wind-force-resisting system shall not be less than 10 psf applied to the area of the building projected on a vertical plane, in accordance with IBC 1609.6.3.

4. Wind uplift rating: UL Class 90 wind uplift rating on roof deck system.

F. Primary Frame Lateral Drift:

1. Wind pressures for purposes of calculating lateral drift of primary frames shall be based on a 50-year mean recurrence interval using the wind speed and exposure factor given on the Drawings, and an importance factor of 1.0.

2. Lateral drift calculation:
   a. Assume frames are pinned-base with no partial base fixity.
   b. Consider frames as "bare" frames, with no additional stiffness provided by roof.
   c. Load sharing between frames is not permitted.

3. Lateral drift limit: Eave height (in inches) h/300 where connected to partitions, masonry veneer or precast, and h/180 where not connected to these materials and free to deflect.

G. Design Load Combinations: Loading combinations of dead load, live load, wind load, and snow load shall be as noted on Drawings.

1.06 SUBMITTALS

A. Certification: Letter by licensed engineer certifying that structure has been designed to comply with the loading criteria given on the Drawings and specified herein.

B. Product Data: Manufacturer's data and specifications for building components and accessories.

C. Shop Drawings:

1. Complete erection drawings showing anchor bolt settings, roof framing,
material, connections, attachment methods, transverse cross-sections, and accessory installation details to clearly indicate proper assembly of building components.

2. Complete details of support beams and other items supporting special loads and schedules of where ceiling loads change or vary.
3. Certified and sealed by a Licensed Professional Engineer, licensed to practice in the State of Texas.
4. Deviations from requirements of Contract Documents shall be clearly identified.

D. Quality Control Submittals (for information only):
   1. Written certification and design calculations prepared and signed by a Professional Engineer, licensed to practice in the State of _____; verifying that building and anchor bolt designs meet indicated loading requirements and specified design criteria.
   2. Manufacturer's certification that pre-engineered building system fabricator/erector is a manufacturer's authorized or franchised dealer.

E. Contract Closeout Submittals: Refer to Section 01 77 00.

F. Project Record Documents: Record changes in building sizes, components, or loading.

1.07 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Minimum 5 years successful experience in fabrication of pre-engineered metal buildings of type and quality required. Must be AISC-MB certified.

B. Designer's Qualifications: Professional Structural Engineer, licensed to practice in the State of Texas with a minimum of 2 years experience in work of this Section.

C. Fabricator/Erector's Qualifications: Minimum 5 years documented experience in work of this Section. Authorized or franchised dealer of manufacturer.

D. Welder's Qualifications: AWS D1.1.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Structural Components:
   1. Store structural members above ground on platforms, skids, or other supports.
   2. Protect steel from corrosion.
   3. Keep primed steel off ground by placing on wooden supports; separate with wooden separator.
   4. Avoid damaging prime coat; use wooden protectors to prevent damage from chain or cable cinches.
PART 2  PRODUCTS

2.01 MANUFACTURERS

A. Building systems specified are manufactured by ________________ and are listed as a standard of quality.

B. Building systems of following manufacturers are acceptable, subject to meeting specification requirements:

4. Inland Buildings.
5. Star Building Systems.
6. NCI Building Systems.
10. Gulf States Manufacturers, Inc.
12. CBC Steel Buildings.
13. MESCO Metal Buildings.
15. Alliance Steel Building Systems.
16. United Structures of America, Inc.

C. Substitutions: Under provisions of Section 01 25 00.

2.02 BASIC MATERIALS

A. Metals:

2. Pipe: ASTM A 53, grade B.
3. Plate or bar stock: 36,000 psi minimum yield strength, ASTM A 36, A 529, A 570, or A 572.
4. Cold-formed members: ASTM A 607, Grade 50 or A 500, Grade B (46 ksi).
5. Galvanized steel sheet: ASTM A 446, with G90 coating, class at manufacturer's option.

B. Paints:

2. Shop primer for galvanized members: Zinc dust-zinc oxide primer, selected for compatibility with galvanized substrate, SSPC Paint Specification No. 5.

C. Fasteners:
1. Primary framing: ASTM A 325, with hardened washers.

D. Anchor Bolts: ASTM A 307, Grade A, galvanized, with suitable nuts and washers.

2.03 TYPICAL FRAMING COMPONENTS

A. Framing Member Thickness: As required by design, but not less than the following:

1. Cold-formed primary framing members: 14 gauge.
2. Cold-formed Secondary framing members: 16 gauge.
3. Intermediate pipe, tube or HSS columns: 3/16”.
4. Webs of welded built-up members: 1/8”.
5. Flanges of welded built-up members: 3/16”.
6. Bracing rods: 1/2” diameter, with turnbuckles or clevises (no cables).

B. Rigid Frames, Wind Unit Frames, and Canopy Beams:
1. Fabricate rigid frames from hot-rolled structural steel. Provide built-up "y-beam" shape rigid frames, consisting of either tapered or parallel flanged beams, factory welded and shop painted. Furnish frames complete with attachment plates, bearing plates, and splice members. Factory drill frames for bolted field assembly, including holes for attaching purlins and girts.
2. Provide length of span and spacing of frames, as indicated on Drawings.
3. Provide pipe, tube or HSS sections to be interior columns, where noted on Drawings.

C. Bearing End Frames: Columns at building corners and a continuous rafter beam supported by end-wall columns, unless shown otherwise.

D. End-wall Columns: 8" minimum, deep cold-formed "C" sections, rolled wide flange or welded built-up "y" shapes.

E. Purlins and Girts: Roll-formed "Z" sections, depth and flange width as required, with stiffening lips formed at an angle 50° with flanges to facilitate nesting. Where holes are required in purlin bottom flange for mechanical and electrical hangers reduction of section shall be accounted for in design.

F. Eave Struts: "C" sections formed to provide adequate backup for both roof and wall panels at building eaves.

G. Wind Bracing:
1. Method:
   a. Roof: Diagonal rod bracing in roof, as required by design. Locations shown on Drawings are schematic, actual locations may vary by design, as approved by Architect.
   b. Wall: Diagonal rod bracing or pinned-base rigid portal frames in sidewalls and endwalls, as required by design and where shown on Drawings.
2. Reinforcing: As a minimum provide double roof purlins, inter-connected by diaphragms in between rigid frames at points of attachment of diagonal roof bracing.

3. Provide adequate means of load transfer along eaves between roof bracing and wall bracing.

4. Provide temporary bracing during erection of structure.

H. Flange Bracing: Inside flange of rigid frames shall be braced laterally by angles connected to flange and web of frame and to web of purlin or girt, so that allowable compressive stress is adequate for any combination of loading.

I. Base Support: Provide a continuous member for attachment of base of wall covering, continuous 18 gauge, galvanized, box-shaped member cast integrally with concrete foundation.

J. Framed Openings: Provide structural framing members at openings, sized to support specified design loads. Hot-dip galvanize framing members exposed to weather.

K. Top-of-Wall Girt: Provide a continuous member for support and attachment of top of exterior walls shown to be framed with metal studs or masonry.

2.04 SHOP PAINTING

A. Paint: Steel surfaces (except surfaces to be welded, contact surfaces of high strength friction type bolted connections and surfaces to be galvanized).

1. Surface preparation:
   a. Primary framing: SSPC SP2 - Hand Tool Cleaning or SP3 - Power Tool Cleaning.

2. Application: 1 coat; follow coating manufacturer’s instructions.


B. Galvanized Finish: ASTM A 123.

PART 3 EXECUTION

3.01 FABRICATION

A. Coordinate members and connection system with structural steel fabricator to assure accurate bolt holes and proper fitting of parts.

B. Shop weld in accordance with AWS Structural Welding Code.

C. Members shall be straight and true within tolerances specified below.

3.02 TOLERANCES

A. Fabrication Tolerances:

1. Variation in height: "3/8".

2. Variation in Width: "1/4".
3. Camber: 1/8" per 10'-0" of length, 1/2" maximum.
4. Sweep: 3/8" per 10'-0" of length, 1" maximum.

3.03 ERECTION

A. Framing:

1. Install in accordance with AISC and AISI Specifications, manufacturer's instructions and reviewed shop drawings.
2. Erect structural framing true to line, level, plumb, rigid, and secure.
3. Level base plates to a true even plane, with full bearing to supporting structures set with double-nutted anchor bolts. Use a non-shrinking grout to obtain uniform bearing and to maintain a level base line elevation, in accordance with Section 03 30 00.
4. Fit members square against abutting components.
5. Temporarily brace members until permanently fastened.
6. Align and adjust various members forming parts of a complete frame or structure after assembly but before fastening.
7. Rigidly connect members using welds or bolts. Welding in accordance with AWS D1.1.

B. Purlins and Girts:

1. Provide rake or gable purlins with tight fitting closure channels and fascias.
2. Locate and space wall girts to suit door and window arrangements and heights.
3. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.
4. Space purlins under steel roof decking to receive single ply roofing at a maximum of 5'-0" on center.

C. Bracing: Provide specified wind bracing in roof, sidewalls, and elsewhere to meet design requirements.

3.04 ACCESSORIES INSTALLATION

A. Framed Openings:

1. Install steel framing to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work.
2. Securely attach to building structural frame.

B. Erection Tolerances:

1. Differential camber between adjacent purlins: 1/4".
2. Spacing: 1".
3. Web out of square with support: 3/8".
4. Top flange deviating from theoretical roof deck plane at any point: -1/4" to +1/2".
3.05 ADJUSTING

A. After erection of structural steel touch up bolt heads and nuts, field welds, and abrasions with same primer used in shop.

3.06 FIELD QUALITY CONTROL

A. Laboratory testing and inspection, as specified in Section 01 45 29.

END OF SECTION
SECTION 14 45 00

VEHICLE Lift

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install vehicle lift including all piping, valves and accessories for a complete installation.

1.02 RELATED SECTIONS

A. Plumbing: Division 22.

B. Electrical: Division 26.

1.03 QUALITY ASSURANCE

A. Manufacturer/Installer: Regularly engaged in the business of manufacturing, installing and servicing vehicle lifts of the type and character required by these specifications.

B. Installer Qualifications: Minimum two years experience lifts and be acceptable to lift manufacturer.

B. Codes and Standards: Conform to the following:


2. ANSI/ALI ALIS: Standard for Automotive Lifts – Safety Requirements for Installation and Service.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications and installation instructions for each principal component or product, and include certified test reports on required testing. List and describe features of the control system, performances and operating characteristics.

B. Shop Drawings: Submit Template drawings and load reactions.

C. Certifications: Provide lifts certified by ETL testing laboratory and labeled with the ETL/AL label that affirms the lifts meet conformance to all applicable provisions of American National Standard ANSI/ALI ALCTV and in compliance with IBC Chapter 30 Section 3001.2.
PART 2 PRODUCTS

2.01 VEHICLE LIFT

A. Description: Heavy duty, two side posts with axle engaging lifting arms and ramps; fully hydraulic.

B. Performance Requirements

1. Rise: Minimum 6’ - 0”.
2. Overall Height: 13’ 8 1/2”.
3. Drive Through Width: 8’-6”.
4. Lifting Capacity: 12,000 lbs.
5. Motor: 2 HP.

C. Provide 5-3/4” and 10” adapter extensions.

D. Manufacturers

1. Basis of Design: Model SPO12 by ROTARY LIFT.
2. Other Manufacturers: Subject to requirements, lifts manufactured by GLOBE PRODUCTS, MANITOWOC LIFTS or MOHAWK RESOURCES, LTD. are acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in strict accordance with manufacturer's written instructions and recommendations.

B. Lubricate equipment in accordance with manufacturer and leave in complete operating condition.

3.02 CLEAN-UP

A. Remove all unused materials and leave all areas and surfaces clean.

3.03 TRAINING

A. Demonstration: Furnish 2-hours of demonstration, instruction and training time conducted by a manufacturer authorized factory representative to designated Owner personnel at project site for all above ground lift equipment and systems provided under this Contract.

END OF SECTION
SECTION 14 60 00

HOISTS AND CRANES

PART 1 GENERAL

1.01 SUMMARY

A. Work under this section includes:

1. Fleet Bay: Two bridge cranes each with a 5 ton hoist. Each crane system includes runway beams, rails, bridge, trolley, hoist, power and control circuit conductors, safety and control mechanisms, and all other parts and services for a complete operating assembly. Each crane system will be suspended from the building steel. Provide all required hangers and suspension devices.

2. Transmission Shop: Monorail beam with a 5 ton hoist. System includes beam, trolley, hoist, power and control circuit conductors, safety and control mechanisms, and all other parts and services for a complete operating assembly. Beam will be suspended from the building steel. Provide all required hangers and suspension devices.

1.02 REFERENCES

A. Equipment furnished under this section shall, except as otherwise noted, comply in all respects with the requirements of the following standards:

1. OSHA: Occupational Safety and Health Administration
   a. Part 1926.554 - Overhead Hoists
   b. Part 1910.179 – Overhead and Gantry Cranes

2. *CMAA: Crane Manufacturer’s Association of America
   a. Specifications for Top Running Bridge & Gantry Type Multiple Girder Electric Overhead Traveling Cranes - No. 70 (2004)

   a. ANSI / ASME HST-4 - 1999 Performance Standard For Overhead Electric Wire Rope Hoists
   b. ANSI / ASME B30.16 – 2003 Overhead Hoists (Underhung)
   c. ANSI / ASME B30.2 - 2001 Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)
   d. ANSI / ASME B30.11 – 2004 Monorails and Underhung Cranes
   e. ANSI / ASME B30.17 – 2003 Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)

4. NEMA: National Electric Manufacturer’s Association

5. NEC: National Electric Code
a. Article 100, Article 240-1, Article 430-31, Article 430-51, Article 610-1, Article 610-31

*Compliance to this standard is limited to the extent such standard is incorporated into and made mandatory by OSHA regulations.

1.03 SUBMITTALS

A. Shop Drawings and Equipment Data
   1. Manufacturer’s catalog data for hoist.
   2. Dimensional drawings and details for bridge crane system.
   3. Wiring schematics.

B. Operations and Maintenance Manuals
   1. Equipment function, normal operating characteristics, and limiting conditions.
   2. Assembly, installation, alignment, and maintenance instructions.
   3. Lubrication and maintenance instructions.
   5. Parts list.
   6. As-built drawing.
   7. Test results.

1.04 APPLICABLE STANDARDS

A. Contractor shall adhere to OSHA, state, and local safety guidelines, laws, rules, and regulations.

B. Contractor shall conform to all applicable ANSI, CMAA, and HMI specifications and/or standards.

C. Comply with CMAA specification 74 or 70, as applicable.

D. Long lead items (hoist, end trucks, drives and controls) will be ordered by contractor upon receipt of purchase order and credit approval. Steel will not be ordered until shop drawings and submittals have been approved by the customer.

E. All electric equipment shall be UL labeled.

PART 2 PRODUCTS

2.01 CRANE SUMMARIES

A. Fleet Bay
   1. Quantity: 2
   2. Crane Type: Single-girder, bottom-running; T-Trac System
   3. Capacity: 5-ton
4. Span: As indicated
5. Service Class: CMAA Class ‘C’
6. Bridge Girders: Wide flange beam
7. End Trucks: Dual motor driven at 100 FPM (max) variable speed complete with brakes.
8. Bridge Electrical: Flat cable festoon system with all hardware to provide independent, roving type operation of an 8-button push-button station
10. Hoist Operation: 18'-0"
11. Hoist: 5-ton capacity electric chain hoist
12. Trolley: Motor driven at 65 FPM (max) variable speed complete with brake
13. Controls: All controls are housed in NEMA 4/12 enclosures
    a. Hoist: Two-speed magnetic type
    b. Trolley: Adjustable frequency drive to provide infinitely variable speed control with fully adjustable soft-start /soft-stop.
    c. Bridge: Adjustable frequency drive to provide infinitely variable speed control with fully adjustable soft-start /soft-stop
14. Power Supply: 460V-3-60

B. Transmission Shop
1. Quantity: 1
2. Crane Type: Single-girder, bottom-running; monorail T-Trac System
3. Capacity: 5-ton
4. Span: As indicated
5. Service Class: CMAA Class ‘C’
6. Monorail Mount: Bottom minimum 16'-0" above floor.
7. Hoist: 5-ton capacity electric chain hoist
8. Trolley: Motor driven at 65 FPM (max) variable speed complete with brake
9. Controls: All controls are housed in NEMA 4/12 enclosures
    a. Hoist: Two speed magnetic type
    b. Trolley: Adjustable frequency drive to provide infinitely variable speed control with fully adjustable soft-start /soft-stop
10. Power Supply: 460V-3-60
11. Paint: 2-coats; Safety Yellow

C. P&C Shop
1. Quantity: 1
2. Crane Type: Single-girder, bottom-running; monorail T-Trac System
3. Capacity: 5-ton
4. Span: As indicated
5. Service Class: CMAA Class ‘C’
6. Monorail Mount: Bottom minimum 16'-0" above floor.
7. Hoist: 5-ton capacity electric chain hoist
8. Trolley: Motor driven at 65 FPM (max) variable speed complete with brake
9. Controls: All controls are housed in NEMA 4/12 enclosures
   a. Hoist: Two speed magnetic type
   b. Trolley: Adjustable frequency drive to provide infinitely variable speed control with fully adjustable soft-start / soft-stop
10. Power Supply: 460V-3-60
11. Paint: 2-coats Alkyd Enamel. Safety Yellow

2.02 MATERIALS

A. Bridge beams: Steel, ASTM A36 or A992
B. End trucks: Steel, ASTM A36 (or equal)
C. Trolley: Steel, ASTM A36 (or equal)
D. Wheels: Cast iron or steel
E. Hooks: Forged steel

2.03 MANUFACTURERS

A. Hoists and Trolleys
   1. Basis of Design: Spacemaster SX Low Headroom Hoist Duty H4 by R&M MATERIALS HANDLING INC.
   2. Other Manufacturers: Subject to requirements, products manufactured by LIFT KING, KONE CRANES or HARRINGTON are acceptable.

B. Bridge/Monorail Components
   1. Basis of Design: T-Trac manufactured by KUNDEL.
   2. Other Manufacturers: Subject to requirements, products manufactured by KONE CRANE, PROSERV CRANE or AMERICAN CRANE are acceptable.

2.04 EQUIPMENT

A. Hoist and Trolley
   1. Bottom-running, single girder cranes shall utilize low headroom electric wire rope hoists.
   2. Equip hoist with an electro-mechanical load-limiting device that shall prevent lifting more than 110% of the rated load.
   3. Hoist and trolley motors shall be per 2.01 above, as applicable.
   4. Hoisting motor(s) shall be two-speed/two winding squirrel cage type with a speed ratio of 6:1.
   5. Hoisting motor(s) shall be totally enclosed with IP55 protection, minimum class F insulation, Klixon type bimetal switch for thermal protection and shall have a 60% ED rating.
6. Provide trolley with an adjustable frequency inverter drive and two-step or infinitely variable speed control for smooth acceleration and deceleration.

7. Trolley motors shall be inverter duty motors with minimum class "F" insulation; motor enclosures shall be TENV [totally enclosed non-ventilated].

8. Provide rotary cam type limit switch equipped with 4 micro-switches. Limit switch shall provide upper and lower limit of hoist travel, hoist slow down prior to reaching upper limit and phase sequence supervision at upper limit. An additional block operated limit shall be included.

9. Hoist motor brake shall be DC disc type with adequate torque to stop and hold over 125% of the hoist rated load.

10. Large diameter rope drum with a minimum of 36:1 drum to wire rope diameter ratio. Groove depth shall be at least 35% of rope diameter. The rope drum shall be equipped with a rope guide to help keep the rope aligned in the grooves of the drum.

11. Wire rope shall be constructed from galvanized steel having a minimum safety factor of 5.

12. Hoist reeving shall be single reeved. Lateral hook drift shall not exceed 1/8 inch per foot of vertical travel on single reeved models.

13. The hoist nameplate is to carry a CSA c/us rating. The actual hoist control enclosure rating shall be at least equivalent to IP55 / NEMA 4 type.

14. Hooks: Forged alloy steel (34CrMo4QT or 34CrNiMo6QT); fitted with a spring-loaded flipper-type safety latch.

15. Hoist shall have a duty rating suitable for the load class and load cycles of the application.

16. AGMA quality class 12 machine cut, hardened and precision ground hoist gearing. The gears inside the hoist gearboxes on models up to 5 ton capacity are lubricated by semi-fluid grease.

17. AGMA quality class 10, hardened and precision ground trolley drive gearing, lubricated by semi-fluid grease.

18. Provide trolleys with safety drop lugs and energy absorbing bumpers.

B. Bridge Girder

1. Bridge girder shall be per 2.01, as applicable.

2. Bridge girders shall be constructed from welded box girders or Structural beams, Steel, ASTM A36 or A992, as required.

C. End Trucks and Bridge Drive

1. End trucks shall be designed in accordance with CMAA specifications as applicable.

2. End trucks shall be bolted to bridge girder.

3. Bridge drive shall be dual-motor (A-4 arrangement per CMAA).

4. Bridge drive shall be designed to stop the bridge within CMAA specifications.

5. End trucks shall be equipped with rail sweeps and energy-absorbing rubber bumpers.

6. Travel limit switches to be provided as necessary for safe operation.
7. Bridge shall be furnished with an adjustable frequency inverter drive and
two-step or infinitely variable speed control for smooth acceleration and
deceleration.
8. Bridge motors shall be inverter duty motors with minimum class “F”
insulation and motor enclosures shall be TENV [totally enclosed non-
ventilated].
9. AGMA quality class 10, hardened and precision ground bridge drive
gearing, lubricated by semi-fluid grease.

D. Power Supply

1. Power supply for the hoist shall be 480 volt, 3 ph., 60 Hz. All power
required for the operation of the hoist, trolley, and end trucks shall be
developed from this source.
2. Runway electrification shall be 4-bar safety type rigid conductors as
manufactured by Insul-8, Duct-O-Wire Company or Wampfler. Wall
mounted disconnect switch and power to runway conductors provided
under Division 26.
3. Cross bridge electrification shall be flat cable style festoon system with
terminal box, multi-conductor cord, plug connectors (when available) and
accessories.

E. Controls: Provide the following controls as applicable:

1. Six-way operation, plug-in pushbutton pendant suspended from
independent festoon track. Radio control may be quoted as an option.
2. Pendant shall include Start (momentary) button and Emergency Stop
(push to maintain, turn to release) that controls a mainline contactor in the
bridge control panel.
3. Pushbutton shall be clearly marked with hoist, trolley and bridge travel
directions.
4. Hoist shall be 2 speed magnetic reversing type (standard) or variable
frequency inverter control (optional) and the trolley and bridge controls
shall be variable frequency inverter control (standard), as required per
section 2.01.
5. Electrical control enclosures: IP55 or NEMA 4 type. Pushbutton
enclosure shall have a rating of IP65, NEMA 4X, 4 or 5.

F. Labeling

1. Hoist and bridge beam shall be labeled with load rating.
2. A corrosion-resistant nameplate shall be fixed to the bridge with the
following information:
   a. Name of manufacturer
   b. Mfg.’s model number and serial number
   c. Capacity
   d. Date of manufacture (month and year)

G. Painting
1. Hoist and trolley: Factory painted (2-part epoxy) per manufacturer's standards.
2. Bridge: Shop cleaned, primed, and painted per manufacturer's standards.
3. The following items shall not be painted:
   a. Rail surfaces in contact with wheels
   b. Wheel running surfaces
   c. Hoist wire rope
   d. Conductor bar, festoon cables and supports

**PART 3 EXECUTION**

**3.01 INSTALLATION AND INSPECTION**

A. Inspect structure and crane rail erection for conformance with reviewed shop drawings and contract documents prior to installation of equipment. Bring nonconforming work to the attention of the customer prior to proceeding with crane installation. Non-conforming runway structure or installation must be corrected prior to load testing of crane system. Cost of delays or additional work due to nonconforming runway structure will be reimbursed by Owner.

B. Bridge crane shall be installed in conformance with manufacturer's instructions and inspected by manufacturer's representative. Provide all necessary accessories to make bridge crane complete, usable and capable of meeting the operating requirements specified in the Operating Requirements. Test, adjust and clean equipment for acceptance by Owner.

**3.02 TESTING**

A. All crane equipment shall be operated through a complete lift and lowering cycle and through complete travel of the bridge and trolley to determine that the equipment shall perform smoothly and safely and that pendant cable length is sufficient to permit operation from desired floor level. All tests shall be carried out with the bridge crane equipment loaded at 125% of capacity. The bridge crane provider shall provide the test weight loads. Any defects shall be corrected by the bridge crane provider without any expense to the Owner.

END OF SECTION
SECTION 21 00 10

GENERAL FIRE SUPPRESSION REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Division requires the furnishing and installing of complete functioning systems, and each element thereof, as specified or indicated on the Drawings and Specifications or reasonably inferred; including every article, device or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include materials, labor, supervision, supplies, equipment, transportation, and utilities.

B. Division 21 of the Specifications and Drawings numbered with prefixes FP generally describe these systems, but the scope of the Fire Suppression work includes all such work indicated in the Contract Documents: Instructions to Bidders; Proposal Form; General Conditions; Supplementary General Conditions; Architectural, Structural, Fire Suppression, Mechanical, Plumbing, Fire Alarm and Electrical Drawings and Specifications; and Addenda.

C. The Drawings have been prepared diagrammatically intended to convey the scope of work, indicating the intended general location and arrangement of the equipment, piping, etc. without showing all the exact details as to elevations, offsets, pipe routing, and other installation requirements. The Contractor shall use the Drawings as a guide when laying out the work and shall verify that materials and equipment will fit into the designated spaces, and which, when installed per manufacturers requirements, will ensure a complete, coordinated, satisfactory and properly operating system.

D. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 7 Section “Penetration Firestopping” for material and methods for firestopping systems.

2. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.

3. Division 21 Section 210515 "Basic Fire Suppression Piping Material and Methods," for general piping and fitting materials and methods.
4. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.

5. Division 21 Section 211100 “Fire Suppression Water Service Piping” for fire suppression piping starting 5 feet outside the building to within the building.

6. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire suppression sprinkler systems inside the building.

1.02 CODES, REFERENCES AND STANDARDS

A. Execute Work in accordance with the National Fire Protection Association Standards and all Local, State, and National codes, ordinances and regulations in force governing the particular class of Work involved. Obtain timely inspections by the constituted authorities, and upon final completion of the Work obtain and deliver to the Owner executed final certificates of acceptance from the Authority Having Jurisdiction.

B. Any conflict between these Specifications and accompanying Drawings and the applicable Local, State and Federal codes, ordinances and regulations shall be reported to the Architect in sufficient time, prior to the submission of Bids, to prepare the Supplementary Drawings and Specification Addenda required to resolve the conflict.

C. The governing codes are minimum requirements. Where these Drawings and Specifications exceed the code requirements, these Drawings and Specification shall prevail.

D. All material, manufacturing methods, handling, dimensions, method or installation and test procedure shall conform to but not be limited to the following industry standards and codes.


E. Contractor shall comply with rules and regulations of public utilities and municipal departments affected by connections of services.

F. All Fire Suppression work shall be performed in compliance with applicable safety regulations, including OSHA regulations. Safety lights, guards, shoring and warning signs required for the performance of the Fire Suppression work shall be provided by the Contractor.

1.03 DEFINITIONS

A. General:

1. Furnish: The term “furnish” is used to mean “supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations.”

2. Install: The term “install” is used to describe operations at the project site including the actual “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.”

3. Provide: The term “provide” means “to furnish and install, complete and ready for the intended use.”

4. Furnished by Owner or Furnished by Others: The item will be furnished by the Owner or Others. It is to be installed and connected under the requirements of this Division, complete and ready for operation, including items incidental to the Work, including services necessary for proper installation and operation. The installation shall be included under the guarantee required by this Division.

5. Engineer: Where referenced in this Division, “Engineer” is the Engineer of Record and the Design Professional for the Work under this Division, and is a Consultant to, and an authorized representative of, the Architect, as defined in the General and/or Supplementary Conditions. When used in this Division, it means increased involvement by, and obligations to, the Engineer, in addition to involvement by, and obligations to, the “Architect”.

6. AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the Work.

7. NRTL: Nationally Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA, etc.), and acceptable to the Authority having Jurisdiction (AHJ) over this project. Nationally Recognized Testing Laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other listed Manufacturers and models that meet the specified criteria.
B. The terms "approved equal", "equivalent", or "equal" are used synonymously and shall mean "accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified". The term "approved" shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

C. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

D. Other definitions for fire protection systems are listed in NFPA Standards 13 and 24.

E. Working Plans, also referred to as Fire Protection Drawings as used in this Section means those documents (including drawings and calculations) prepared pursuant to the requirements contained in NFPA 13 for obtaining approval of the Authority Having Jurisdiction.

F. The following definitions apply to excavation operations:

1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.

2. Sub-base: as used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.

3. Subgrade: as used in this Section refers to the compacted soil immediately below the slab or pavement system.

4. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Architect.

1.04 COORDINATION

A. The Contractor shall visit the site and ascertain the conditions to be encountered while installing the Work under this Division, verify all dimensions and locations before purchasing equipment or commencing work, and make due provision for same in the bid. Failure to comply with this requirement shall not be considered justification for omission, alteration, incorrect or faulty installation of Work under this Division or for additional compensation for Work covered by this Division.

B. The Contractor shall refer to Drawings of the other disciplines and to relevant equipment drawings and shop drawings to determine the extent of clear spaces. The Contractor shall make offsets required to clear equipment, beams and other structural members; and to facilitate concealing piping in the manner anticipated in the design.
C. The Contractor shall maintain a foreman on the jobsite at all times to coordinate his work with other contractors and subcontractors so that various components of the Fire Suppression systems will be installed at the proper time, will fit the available space, and will allow proper service access to the equipment. Carry on the work in such a manner that the work of the other contractors and trades will not be handicapped, hindered, or delayed at any time.

D. Work of this Division shall progress according to the "Construction Schedule" as established by the Prime Contractor and his subcontractors and as approved by the Architect/Engineer. Cooperate in establishing these schedules and perform the Work under this Division, in a timely manner in conformance with the construction schedule so as to ensure successful achievement of schedule dates.

E. The contractor shall coordinate work in this section with all related trades. Work and/or equipment provided in other sections and related to the fire protection system shall include, but not be limited to:

1. Sprinkler monitoring equipment (water flow switches, valve tampers, etc) shall be provided by the fire sprinkler installer, but wired and connected by Division 28.

F. System shall be complete and operational with power and control wiring provided to meet the design intent shown on the drawings and described within the specification sections.

1.05 MEASUREMENTS AND LAYOUTS

A. The drawings are schematic in nature, but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the building. Figured dimensions shall be taken in preference to scale dimensions. Determine exact locations by job measurements, by checking the requirements of other trades, and by reviewing the Contract Documents. The Contractor will be held responsible for errors which could have been avoided by proper checking and inspection.

1.06 SUBMITTALS

A. Refer to Division 1 and General Conditions for submittal requirements, in addition to requirements specified herein.

B. Submittals and shop drawings shall not contain HEI's firm name or logo, nor shall they contain the HEI engineer's seal and signature. They shall not be copies of HEI's work product. If the Contractor desires to use elements of such product, the license agreement for transfer of information at the end of this section must be used.

C. Assemble and submit for review manufacturer product literature for material and equipment to be furnished and/or installed under this Division.
Literature shall include shop drawings, manufacturer product data, performance sheets, samples, and other submittals required by this Division [as noted in Table 1 at the end of this Section]. Provide the number of submittals required by Division 1; if hard-copy sets are provided, submit a minimum of seven (7) sets. General product catalog data not specifically noted to be part of the specified product will be rejected and returned without review.

D. Separate submittals according to individual specification sections. Only resubmit those sections requested for resubmittal.

E. Provide submittals in sufficient detail so as to demonstrate compliance with these Contract Documents and the design concept. Highlight, mark, list or indicate the materials, performance criteria and accessories that are being proposed. Illegible submittals will be rejected and returned without review.

F. Refer to individual Sections for additional submittal requirements.

G. Transmit submittals as early as required to support the project schedule. Allow two weeks for Engineer review time, plus to/from mailing time via the Architect, plus a duplication of this time for resubmittals, if required. Transmit submittals as soon as possible after Notice to Proceed and before Fire Suppression construction starts.

H. Before transmitting submittals and material lists, verify that the equipment submitted is mutually compatible with and suitable for the intended use. Verify that the equipment will fit the available space and maintain manufacturer recommended service clearances. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.

I. Submittals shall contain the following information:

1. The project name.

2. The applicable specification section and paragraph.

3. Equipment identification acronym as used on the drawings.

4. The submittal date.

5. The Contractor's stamp, which shall certify that the stamped drawings have been checked by the Contractor, comply with the Drawings and Specifications, and have been coordinated with other trades.

6. Submittals not so identified will be returned to the Contractor without action.

J. Refer to Division 1 for acceptance of electronic submittals for this project. For electronic submittals, Contractor shall submit the documents in
accordance with this Section and the procedures specified in Division 1. Contractor shall notify the Architect and Engineer that the submittals have been posted. If electronic submittal procedures are not defined in Division 1, Contractor shall include the website, user name and password information needed to access the submittals. For submittals sent by e-mail, Contractor shall copy the Architect and Engineer’s designated representatives. Contractor shall allow for the Engineer review time as specified above in the construction schedule. Contractor shall submit only the documents required to purchase the materials and/or equipment in the submittal.

K. The checking and subsequent acceptance by the Engineer and/or Architect of submittals shall not relieve responsibility from the Contractor for (1) deviations from the Drawings and Specifications; (2) errors in dimensions, details, sizes of equipment, or quantities; (3) omissions of components or fittings; and (4) not coordinating items with actual building conditions and adjacent work. Contractor shall request and secure written acceptance from the Engineer and Architect prior to implementing any deviation.

L. Provide shop drawings prepared in accordance with referenced standards identified as "Working Plans", including hydraulic calculations where applicable. Shop drawings shall be signed and sealed by a Professional Engineer registered in the state in which the project is located where required by local authorities having jurisdiction, or NICET Level III or IV certified technician. Submit copies of the certification for the designer with submittal. Shop drawings consisting of the following shall be furnished at a minimum. Refer to NFPA 13 for additional requirements.

1. Scaled site plan indicating underground piping with sizes and hydrants utilized for flow test in relation to the building.

2. Layout drawings of complete fire sprinkler system indicating relationship to all other trades. This shall include all equipment, piping and a reflected ceiling plan indicating sprinkler locations.

3. Complete details and sections as required to clearly define and clarify the design indicated.

4. Shop drawings shall be to a standard scale and not less than $\frac{3}{32}$" = 1'-0".

5. Hydraulic calculations shall be based on a water flow test conducted at the site within twelve (12) months of the submittal of plans for approval. The contractor shall be responsible for obtaining the flow test if existing data is not available. Flow test information shall be documented on shop drawings with an accompanying site plan to scale. A minimum 5 psi safety factor shall be included in all calculations.

   a. Hydrant testing shall be in accordance with NFPA 13 and 291 requirements.
6. Available fire-hydrant flow test records indicate the following conditions:
   a. Date: 02/23/2017
   b. Performed by: Corpus Christi Water Department
   c. Location: TX HWY 286 N.
   d. Static Pressure at Residual Fire Hydrant: 54 psig.
   f. Residual Pressure at Residual Fire Hydrant: 50 psig.

M. Contractor shall prepare installation drawings (working shop drawings) based upon this design. Requests for deviations from the approved design shall be submitted in writing to the Engineer of Record for approval. Shop drawings showing deviations from the design without prior approval will not be approved.

N. Provide welders' qualification certificates.

O. Provide Test Reports and Certificates including:
   1. "Contractor's Material & Test Certificate for Aboveground Piping"
   2. "Contractor's Material & Test Certificate for Underground Piping" as described in NFPA
      a. Underground piping test certificate shall be obtained prior to connection of the aboveground system.

P. 1.07 ELECTRONIC DRAWING FILES

A. In preparation of shop drawings or record drawings, Contractor may, at their option, obtain electronic drawing files in AutoCAD or DXF format from the Engineer for a shipping and handling fee of $200 for a drawing set up to 12 sheets and $15 per sheet for each additional sheet. Contact the Architect for Architect's written authorization. Contractor shall complete and send the form attached at the end of this Section along with a check made payable to Henderson Engineers, Inc. Contractor shall indicate the desired shipping method and drawing format on the attached form. In addition to payment, Architect's written authorization and Engineer's release agreement form must be received before electronic drawing files will be sent.

1.08 SUBSTITUTIONS

A. Refer to Division 1 and General Conditions for substitutions
B. Materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution.

C. No substitutions will be considered prior to receipt of Bids unless written request for approval to bid has been received by the Engineer at least ten (10) calendar days prior to the date for receipt of Bids. Each such request shall include the name of the material or equipment for which substitution is being requested, and a complete description of the proposed substitution including drawings, cut sheets, performance and test data, and all other information necessary for an evaluation. Include a statement setting forth changes in other materials, equipment or other work that incorporation of the substitution would require. The burden of proof of the merit of the proposed substitution is upon the proposer. The Engineer’s decision to approve or disapprove a substitution in a Bid is final.

D. If the proposed substitution is approved prior to receipt of Bids, such approval will be stated in an Addendum. Bidders shall not rely upon approvals made in any other manner. Verbal approval will not be given.

E. No substitutions will be considered after the Contract is awarded unless specifically provided in the Contract Documents.

1.09 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 1 and General Conditions for Operation and Maintenance Manuals.

B. Submit manuals prior to requesting the final punch list and before all requests for Substantial Completion.

C. Instruct the Owner’s permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division.

D. Prior to Substantial Completion for the project, furnish to the Architect, [for Engineer’s review,] and for Owner’s use, four (4) copies of Operation and Maintenance Manuals in labeled, hard-back three-ring binders, with cover, binding label, tabbed dividers and plastic insert folders for Record Drawings. Include local contacts, complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications.

E. Include the following sections with the appropriate information for each section:

1. Typewritten Index.

2. Qualifications. Provide designer and installer qualification.
3. Bill of Materials. Provide complete nomenclature, model number and vendor information for all parts.

4. Operating Instructions. Complete instructions detailing operation and maintenance of all equipment installed.

5. Product Data: Provide product cut-sheets for all equipment utilized and installed.


7. Testing/Certification: Provide all completed testing and certification forms as required per NFPA 13 and 25.

8. Contact list with minimum three service representative phone numbers.

F. Refer to Division 1 for acceptance of electronic manuals for this project. For electronic manuals, Contractor shall submit the documents in accordance with this Section and the procedures specified in Division 1. Contractor shall notify the Architect and Engineer that the manuals have been posted. If electronic manual procedures are not defined in Division 1, Contractor shall include the website, user name and password information needed to access the manuals. For manuals sent by e-mail, Contractor shall copy the Architect and Engineer’s designated representatives.

1.10 SPARE PARTS

A. Provide to the Owner the spare parts specified in the individual sections in Division 21 specifications.

1.11 RECORD DRAWINGS

A. A set of work prints of the Contract Documents shall be kept on the jobsite during construction for the purpose of noting changes. During the course of construction, the Contractor shall indicate on these Documents changes made from the original Contract Documents. Particular attention shall be paid to those items which need to be located for servicing. Underground utilities shall be located by dimension from column lines.

B. Refer to Division 1 and General Conditions for Record Drawings

C. At the completion of the project, the Contractor shall obtain, at their expense, reproducible copies of the final drawings and incorporate changes noted on the jobsite work prints onto these drawings. These changes shall be done by a skilled drafter. Each sheet shall be marked "Record Drawing", along with the date. These drawings shall be delivered to the Architect/Engineer.

D. The fire shop drawings and all information contained therein shall be utilized as the basis for the Record Drawings.
1.12 TRAINING

A. Provide training as indicated in each specific section. Schedule training with the Owner at least 7 days in advance. Video tape the training sessions in a format as agreed to with the Owner. Provide three copies of each session to the Owner and obtain written receipt from the Owner.

1.13 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 and General Conditions for Delivery, Storage and Handling.

B. Equipment and material shall be delivered to the job site in their original containers with labels intact, fully identified with manufacturer's name, model, model number, type, size, capacity and Underwriter's Laboratories, Inc. labels and other pertinent information necessary to identify the item.

C. Deliver, receive, handle and store equipment and materials at the job site in the designated area and in such a manner as to prevent equipment and materials from damage and loss. Store equipment and materials delivered to the site on pallets and cover with waterproof, tear resistant tarp or plastic or as required to keep equipment and materials dry. Follow manufacturer's recommendations, and at all times, take every precaution to properly protect equipment and material from damage, to include the erection of temporary shelters to adequately protect equipment and material stored at the Site. Equipment and/or material which become rusted or damaged shall be replaced or restored by the Contractor to a condition acceptable to the Architect.

D. The Contractor shall be responsible for the safe storage of his own tools, material and equipment.

1.14 GUARANTEES AND WARRANTIES

A. Refer to Division 1 and General Conditions for Guarantees and Warranties.

B. Furnish service and maintenance of fire protection system for one year from date of substantial completion.

C. Each system and element thereof shall be warranted against defects due to faulty workmanship, design or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty in the Construction Documents or manufacturer's standard warranty. The Contractor shall remedy defects occurring within a period of one year from the date of Substantial Completion or as stated in the General Conditions.

D. The following additional items shall be guaranteed:

1. Piping shall be free from obstructions, holes or breaks of any nature.
2. Proper sloping of pipe to drain in each piping system per NFPA 13.

E. The above guarantees shall include labor (including travel expenses), troubleshooting and material; and repairs or replacements shall be made without additional cost to the Owner.

F. The remedial work shall be performed promptly, upon written notice from the Architect or Owner.

G. At the time of Substantial Completion, deliver to the Owner warranties with terms extending beyond the one year guarantee period, each warranty instrument being addressed and stating the commencement date and term.

1.15 PROJECT CONDITIONS

A. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits permitted by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.

1.16 QUALITY ASSURANCE

A. All work under this division shall be executed in a thorough professional manner by competent and experienced workmen licensed to perform the Work specified.

B. All work shall be installed in strict conformance with manufacturer's requirements and recommendations. Equipment and materials shall be installed in a neat and professional manner and shall be aligned, leveled, and adjusted for satisfactory operation.

C. Material and equipment shall be new, shall be of the best quality and design, shall be current model of the manufacturer, shall be free from defects and imperfections and shall have markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size and capacity. Material and equipment of the same type shall be made by the same manufacturer whenever practicable.

D. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

E. 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.

F. Threaded joints shall conform to ASME B1.20.1, Pipe Threads, General Purpose and the Pipe Fitters Handbook.

G. Regulatory Requirements: Comply with all standards listed in Section 1.2 and all applicable local requirements.
H. All electrical equipment provided and the wiring and installation of electrical equipment shall be in accordance with the requirements of this Section, Division 26 and Division 28.

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

**PART 2  PRODUCTS**

2.01 GENERAL

A. Electrical Contractors shall provide all motors, starters, disconnects, wire, conduit, etc. as specified in the Construction Documents. If, however, the Fire Suppression Contractor furnishes a piece of equipment requiring a different motor, starter, disconnect, wire size, etc. than what is shown and/or intended on the Construction Documents, the Fire Suppression Contractor shall coordinate the requirements with any other Contractor and shall be responsible for any additional cost incurred by any other Contractor that is associated with installing the different equipment and related accessories for proper working condition.

B. Refer to Division 26, "Common Work Results for Electrical" for specification of motor connections.

C. Refer to Division 26, "Enclosed Switches and Circuit Breakers" for specification of disconnect switches.

D. Refer to Division 28, "Digital Addressable Fire Alarm Systems" for specification of sprinkler monitoring equipment connections.

E. All fire protection equipment shall be UL listed and FM approved (FM Insureds only) for its intended use and in conformance with the applicable NFPA codes.

F. System Pressures: All system components shall be listed for the actual designed system pressures.

2.02 EXCAVATION AND BACKFILLING

A. Perform excavation of every description, of whatever substance encountered and to the depth required in connection with the installation of the work under this Division. Excavation shall be in conformance with applicable Division and section of the General Specifications.

B. Roads, alleys, streets and sidewalks damaged during this work shall be restored to the satisfaction of Authorities Having Jurisdiction.

C. Trenches close to walks or columns shall not be excavated without prior consultation with the Architect.

D. The Contractor shall erect barricades around excavations, for safety, and shall place an adequate number of amber lights on or near the work and shall keep them burning from dusk to dawn. The Contractor shall be held responsible for any damage that any parties may sustain in consequence of neglecting the necessary precautions in prosecuting the work.

E. Slope sides of excavations to comply with local, state and federal codes and ordinances. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local, state and federal codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

1. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.

F. Install sediment and erosion control measures in accordance with local codes and ordinances.

G. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches. In no case shall sewers be used as drains for such water.

H. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
1. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.

2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.

2.03 CUTTING AND PATCHING

A. The Contractor shall do necessary cutting of walls, floors, ceilings and roofs.

B. No structural member shall be cut without permission from Architect and Structural Engineer.

C. Patch around openings to match adjacent construction.

D. After the final waterproofing membrane has been installed, roofs may be cut only with written permission by the Architect.

2.04 CLEANING

A. Dirt and refuse resulting from the performance of the work shall be removed from the premises as required to prevent accumulation. The Fire Suppression Contractor shall cooperate in maintaining reasonably clean premises at all times.

B. Immediately prior to the final inspection, the Fire Suppression Contractor shall clean material and equipment installed under the Fire Suppression Contract. Dirt, dust, plaster, stains, and foreign matter shall be removed from surfaces including components internal to equipment. Damaged finishes shall be touched-up and restored to their original condition.

2.05 SUBSTANTIAL COMPLETION REVIEW

A. Prior to requesting inspection for "CERTIFICATE OF SUBSTANTIAL COMPLETION", the Contractor shall complete the following items:

1. Submit complete Operation and Maintenance Manuals.

2. Submit complete Record Drawings.

3. Perform special inspections.

4. Start-up testing of systems.

5. Removal of temporary facilities from the site.

6. Comply with requirements for Substantial Completion in the "General Conditions".
B. The Contractor shall request in writing a review for Substantial Completion. The Contractor shall give the Architect/Engineer at least seven (7) days notice prior to the review.

C. The Contractor’s written request shall state that the Contractor has complied with the requirements for Substantial Completion.

D. Upon receipt of a request for review, the Architect/Engineer will either proceed with the review or advise the Contractor of unfulfilled requirements.

E. If the Contractor requests a site visit for Substantial Completion review prior to completing the above mentioned items, they shall reimburse the Architect/Engineer for time and expenses incurred for the visit.

F. Upon completion of the review, the Architect/Engineer will prepare a “final list” of outstanding items to be completed or corrected for final acceptance.

G. Omissions on the “final list” shall not relieve the Contractor from the requirements of the Contract Documents.

H. Prior to requesting a final review, the Contractor shall submit a copy of the final list of items to be completed or corrected. He shall state in writing that each item has been completed, resolved for acceptance or the reason it has not been completed.

END OF SECTION 210010
AGREEMENT FOR TRANSFER OF INFORMATION

MACHINE-READABLE FORMAT

PROJECT NAME: _____________________________ PROJECT NO/PHASE: _____________________________

Made this day, ____________________________________ __

By and Between Henderson Engineers, Inc.(hereinafter referred to as ENGINEER) and (hereinafter referred to as RECIPIENT).

The enclosed electronic media are provided pursuant to your request for the purpose of production of shop drawings or record drawings. In using it, modifying it, or accessing information from it, you are responsible for confirmation, accuracy, and checking of the data from the media. ENGINEER hereby disclaims any and all responsibility from any results obtained in use of this electronic media and does not guarantee any accuracy of the information.

RECIPIENT agrees that it shall not use the information provided by ENGINEER for any purpose other than that described above without the express written consent of ENGINEER. RECIPIENT also hereby acknowledges that the data delivered by ENGINEER is for use by RECIPIENT only, and is not to be released to any other party without the written consent of the ENGINEER and does not transfer ownership of the instruments of professional service.

RECIPIENT understands that the automated conversion of information and data from the system and format used by ENGINEER to an alternate system or format cannot be accomplished without the possibility of introduction of inexactitudes, anomalies, and errors. In the event project documentation provided to RECIPIENT in machine readable form is so converted, RECIPIENT agrees to assume all risk associated therewith, and to the fullest extent permitted by law, to hold harmless and indemnify ENGINEER from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney’s fees, arising therefrom or in connection therewith.

RECIPIENT recognizes that changes or modifications to ENGINEER’S instruments of professional service introduced by anyone other than ENGINEER may result in adverse consequences that ENGINEER can neither predict nor control. Therefore, and in consideration of ENGINEER’S agreement to deliver its instruments of professional service in machine readable format, RECIPIENT agrees, to the fullest extent permitted by law to hold harmless and indemnify ENGINEER from and against all claims, liabilities, losses, damages, and costs, including misuse or reuse by others of the machine readable information and data provided by ENGINEER under this Agreement. The foregoing indemnification applies, without limitation, to any use of the project documentation on another project, for additions to this project, or for completion of this project by others; ENGINEER may authorize excepting only such use in writing.

Send a check for shipping and handling costs in the amount of $200 for an electronic drawing set up to 12 sheets plus $15 per sheet in excess of 12 sheets payable to Henderson Engineers, Inc. along with completed and signed agreement and Architect’s written
authorization to receive electronic media. Be sure to indicate below the desired shipping method, format type and media type.

Sheet numbers requested: __________________________________________________________

1-12 sheets @ $200 + ___________ sheet(s) @ $15 each = $________ total due to Henderson Engineers, Inc.

Signature ____________________________ Signature ____________________________

________________________________________

HENDERSON ENGINEERS, INC. RECIPIENT

Date _______ Date _______

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SECTION 21 05 00
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1  GENERAL

1.01  SUMMARY

A. This Section includes limited scope general construction materials and methods for application with Fire Suppression installations as follows:

1. Access panels and doors in walls, ceilings, and floors for access to Fire Suppression materials and equipment.

2. Non-shrink grout for equipment installations.

3. Miscellaneous metals for support of Fire Suppression materials and equipment.

4. Wood grounds, nailers, blocking, fasteners, and anchorage for support of Fire Suppression materials and equipment.

5. Joint sealers for sealing around Fire Suppression materials and equipment.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 7 Section “Penetration Firestopping” for material and methods for firestopping systems.

2. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, fire flow test data, obtaining electronic drawings files, shop drawings and record drawings.

3. Division 21 Section 210515 “Basic Fire Suppression Piping Material and Methods,” for general piping and fitting materials and methods.

4. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.

5. Division 21 Section 211100 “Fire Suppression Water Service Piping” for fire suppression piping starting 5 feet outside the building to within the building.

6. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire suppression sprinkler systems inside the building.
1.02 SUBMITTALS

A. General: Submit the following in accordance with Division 1 and Division 21 Section “General Fire Suppression Requirements”.

1. Product data for the following products:
   a. Access panels and doors.
   b. Through and membrane-penetration firestopping systems.

1.03 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL “Building Materials Directory” for rating shown.

1. Provide UL Label on each fire-rated access door.

PART 2 PRODUCTS

2.01 ACCESS TO EQUIPMENT

A. Acceptable Manufacturers:

1. Bar-Co., Inc.
2. Elmdor Stoneman.
3. JL Industries
6. Milcor
7. Nystrom Building Products
8. Wade
9. Zurn

B. Access Doors:

1. Provide access doors for all concealed equipment, except where above lay-in ceilings. Refer to Section “Identification for Fire Suppression Piping and Equipment” for labeling of access doors.
2. Access doors shall be adequately sized for the devices served with a minimum size of 18 inches x 18 inches, furnished by the respective Contractor or Subcontractor and installed by the General Contractor.

3. Access doors must be of the proper construction for type of construction where installed.

4. The exact location of all access doors shall be verified with the Architect prior to installation.

5. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.

6. Frames: 16-gauge steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling.
   a. For installation in masonry, concrete, ceramic tile, or wood paneling: 1-inch-wide exposed perimeter flange and adjustable metal masonry anchors.
   b. For installation in gypsum wallboard or plaster: perforated flanges with wallboard bead.
   c. For installation in full-bed plaster applications: galvanized, expanded metal lath and exposed casing bead, welded to perimeter of frame.

7. Flush Panel Doors: 14-gauge sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.
   a. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.


2.02 FIRE SUPPRESSION EQUIPMENT NAMEPLATE DATA

A. For each piece of power operated Fire Suppression equipment, provide a permanent operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliance's, and similar essential data. Locate nameplates in an accessible location.
2.03 Grout
A. Provide nonshrink, nonmetallic grout conforming to ASTM C 1107, Grade B, in premixed and factory-packaged containers.
B. Grout shall have post-hardening, volume-adjusting, dry, non-staining, non-corrosive, non-gaseous, hydraulic-cement characteristics and shall be as recommended by manufacturer for interior and exterior applications.
C. Grout shall have 5,000 psi, 28-day compressive strength design mix.

2.04 Miscellaneous Metals
A. Steel plates, shapes, bars, and bar grating: ASTM A 36.
B. Cold-Formed Steel Tubing: ASTM A 500.
C. Hot-Rolled Steel Tubing: ASTM A 501.
E. Fasteners: Zinc-coated, type, grade, and class as required.

2.05 Miscellaneous Lumber
A. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.
   1. Framing materials shall be fire resistant treated for use in Type I and II buildings.
B. Construction Panels: Plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than 15/32 inches.
   1. Framing materials shall be fire resistant treated for use in Type I and II buildings.

2.06 Joint Sealers
A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.
B. Colors: As selected by the Architect from manufacturer’s standard colors.
C. Elastomeric Joint Sealers: Provide the following types:
1. One-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer. Provide one of the following:

   a. "Dow Corning 790," Dow Corning Corp.
   d. "864," Pecora Corp.
   e. "Rhodia 5C," Rhone-Poulenc, Inc.
   g. "Spectrem 2," Tremco, Inc.
   h. "Dow Corning 795," Dow Corning Corp.
   i. "Rhodia 7B," Rhone-Poulenc, Inc.
   j. "Rhodia 7S," Rhone-Poulenc, Inc.

2. One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes. Provide one of the following:

   a. "Dow Corning 786," Dow Corning Corp.

D. Acrylic-Emulsion Sealants: One-part, nonsag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications on interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent.

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

b. "AC-20," Pecora Corp.


PART 3 EXECUTION

3.01 INSTALLATION OF ACCESS DOORS

A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

B. Adjust hardware and panels after installation for proper operation.

3.02 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor Fire Suppression materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.03 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor Fire Suppression materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.04 PREPARATION FOR JOINT SEALERS

A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.
3.05 APPLICATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers’ printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.


B. Tooling: Immediately after sealant application and prior to time shining or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.06 PENETRATIONS:

A. New Construction:

1. Coordinate with Divisions 03 and 04 for installation of sleeves and sleeve seals integrally in cast-in-place, precast, and masonry walls and horizontal slabs where indicated on the Drawings or as required to support piping penetrations.

B. Provide sleeves and/or box frames for openings in all concrete and masonry construction and fire or smoke partitions, for all mechanical work that passes through such construction; Coordinate with other trades and Divisions to dimension and lay out all such openings.

C. The General Contractor will provide only those openings specifically indicated on the Architectural or Structural Drawings as being provided under the General Contractor’s work.

D. The cutting of new or existing construction shall not be permitted except by written approval of the Architect.

E. Floor sleeves shall be fitted with means for attachment to forms and shall be of length to extend at least two inches above the floor level.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

END OF SECTION
PART 1  GENERAL

1.01  SUMMARY

A. This Section specifies piping materials and installation methods common to more than one Section of Division 21 and includes piping, joining materials, piping specialties and basic piping installation instructions.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, fire flow test data, obtaining electronic drawings files, shop drawings and record drawings.

2. Division 21 Section 210500 ”Common Work Results for Fire Suppression,” for materials and methods for wall and floor penetrations.

3. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.

4. Division 21 Section 211100 “Fire Suppression Water Service Piping” for fire suppression piping starting 5 feet outside the building to within the building.

5. Division 21 Section 211313 ”Water-based Fire Suppression Systems” for fire-suppression sprinkler systems inside the building.

1.02  SUBMITTALS

A. Refer to Division 1 and Division 21 “General Fire Suppression Requirements” for administrative and procedural requirements for submittals.

B. Product Data: Submit product data on the following items:

1. Piping and Fittings
2. Escutcheons
3. Dielectric Unions and Fittings
4. Sleeves and Mechanical Sleeve Seals
1.03 QUALITY ASSURANCE


B. Threaded joints shall conform to ASME B1.20.1, Pipe Threads, General Purpose and the Pipe Fitters Handbook.

C. UL: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved (FM Insureds only) for fire service.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All fire suppression system materials and components essential to successful system operation shall be listed for their intended purpose.

B. General: Refer to the individual piping system specification sections in Division 21 for specifications on piping and fittings relative to that particular system.

2.02 STEEL PIPE AND FITTINGS

A. All piping 2-inch and smaller:
   1. With the use of welded or roll grooved fittings: ASTM A135 or 795, Grade A, Schedule 10 or 40, seamless or ERW, black steel pipe.
   2. With the use of threaded fittings: ASTM A135 or 795, Grade A, Schedule 40, seamless or ERW, black steel pipe. All 1-inch piping shall have threaded ends.

B. All piping 2-1/2" and larger: ASTM A135 or 795, Grade A, Schedule 10, ERW, black steel pipe, threaded or roll grooved ends.

C. Piping used in dry pipe sprinkler systems shall be ASTM A135 or 795, Type E, Grade A, Schedule 40, black steel pipe, threaded or roll grooved ends.

D. All piping on the exterior of the building shall be externally galvanized.

E. Acceptable alternatives to Schedule 40 and Schedule 10 pipe shall be manufactured to standards recognized by NFPA 13. Threaded pipe shall have a corrosion resistance rating (CRR) of 1.0 or greater. Crimp type couplings shall not be used. Threadable thinwall pipe with CRR less than 1.0 not permitted.

F. Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

H. Steel Couplings: ASTM A 865, threaded


K. Malleable- or Ductile-Iron Unions: UL 860.


M. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.


O. Grooved-Joint, Steel-Pipe Appurtenances


2. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

3. Grooved mechanical couplings including gaskets used on dry-pipe systems shall be listed for dry-pipe service.

2.03 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.

2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
2.04 LISTED FIRE-PROTECTION VALVES

A. General Requirements:
   1. Valves shall be UL listed or FM approved.

B. Check Valves:
   1. Description: Swing-check type, rubber-face checks unless otherwise indicated, and ends matching piping.
   4. Type: Swing check.
   5. Body Material: Cast iron.
   6. End Connections: Flanged or grooved.
   7. Bronze OS&Y Valves below are available in 2-inch and smaller.
   8. Bronze OS&Y Gate Valves:
      9. Description: Bronze body and bonnet and bronze stem.
      10. Standard: UL 262.
      13. End Connections: Threaded or grooved.

C. Iron OS&Y Gate Valves:
   1. Description: Iron body and bonnet and bronze seating material.
   4. Body Material: Cast or ductile iron.
   5. End Connections: Flanged or grooved.

D. Indicating-Type Butterfly Valves:
2. Pressure Rating: 175 psig minimum.

3. Valves NPS 2 and Smaller:
   a. Valve Type: Ball or butterfly.
   b. Body Material: Bronze.
   c. End Connections: Threaded or grooved.

4. Valves NPS 2-1/2 and Larger:
   a. Valve Type: Butterfly.
   b. Body Material: Cast or ductile iron.
   c. End Connections: Flanged or grooved.

5. Valve Operation: Integral, prewired supervisory switch and visual indicating device.

### 2.05 TRIM AND DRAIN VALVES

**A. General Requirements:**


2. Pressure Rating: 175 psig minimum.

**B. Automatic (Ball Drip) Drain Valves:**


2. Pressure Rating: 175 psig minimum.

3. Type: Automatic draining, ball check.


5. End Connections: Threaded.

### 2.06 FIRE-DEPARTMENT CONNECTIONS

**A. Exposed-Type, Fire-Department Connection:**


2. Type: Exposed, projecting, for wall mounting.

4. **Body Material:** Corrosion-resistant metal.

5. **Inlets:** NPS 2-1/2 brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.

6. **Caps:** Brass, lugged type, with gasket and chain.

7. **Escutcheon Plate:** Round, brass, wall type.

8. **Outlet:** Back, with pipe threads, NPS 4”

9. **Number of Inlets:** Two.

10. **Escutcheon Plate Marking:** Similar to "AUTO SPKR."

11. **Finish:** Rough brass or bronze.

### 2.07 PIPING SPECIALTIES

**A. Escutcheons:** Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings.

1. **One-Piece, Cast-Brass Type:** With polished, chrome-plated finish and setscrew fastener.

2. **One-Piece, Stamped-Steel Type:** With chrome-plated finish and spring-clip fasteners.

3. **Split-Casting Brass Type:** With polished, chrome-plated finish and with concealed hinge and setscrew.

4. **Split-Plate, Stamped-Steel Type:** With chrome-plated finish, concealed hinge, and spring-clip fasteners.

**B. Floor Plates:** Inside diameter shall closely fit pipe outside diameter. Outside diameter shall completely cover the opening in floors, walls, or ceilings.

1. **One-Piece Floor Plates:** Cast-iron flange with holes for fasteners.

2. **Split-Casting Floor Plates:** Cast brass with concealed hinge.

**C. Unions:** Malleable-iron, Class 150 for low pressure service and class 250 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

**D. Dielectric Unions and Fittings:** Provide factory-fabricated dielectric unions and fittings with appropriate end connections for the pipe materials in which
installed (screwed, soldered, or flanged), which effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion.

E. Pressure Gauges


2. Dial Size: 3-1/2- to 4-1/2-inch diameter.

3. Pressure Gage Range: 0 to 300 psig.

4. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

5. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

2.08 PENETRATIONS

A. Sleeves:

1. Steel Sleeves: Schedule 40 galvanized, welded steel pipe, ASTM A-53 grade A or 12 gauge (0.1084 inches) welded galvanized steel formed to a true circle concentric to the pipe.

2. Sheet-Metal Sleeves: 10 gauge (0.1382 inches), galvanized steel, round tube closed with welded longitudinal joint.

3. Frames for rectangular openings attached to forms and of a maximum dimension established by the Architect. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, provide 18 gauge (0.052 inches) welded galvanized steel. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, provide 10 gauge (0.1382 inches) welded galvanized steel. Notify the General Contractor or Architect before installing any box openings not shown on the Architectural or Structural Drawings.

4. Box Frames: Frames for rectangular openings shall be of welded 12 gauge steel attached to forms and of a maximum dimension established by the Architect. Contractor shall notify the General Contractor or Architect before installing any box openings not shown on the Architectural or Structural Drawings.

B. Mechanical Sleeve Seals: Modular Plumbing type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which
cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   a. Pressure Plates: Carbon steel or stainless steel.
   b. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.02 PIPING INSTALLATIONS

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated. Refer to individual system specifications for requirements for coordination drawing submittals.

B. Coordinate installation of horizontal piping with other components. Allow sufficient space above removable ceiling panels to allow for panel removal (minimum 6” clearance).

C. Install system such that all piping is rigidly secured and supported. All ductwork, lights, structural members and main runs of piping shall take precedence over sprinkler piping. Cutting of structural members for passage of sprinkler pipes or hangers shall not be permitted. All horizontal piping in ceiling space shall be at an elevation above the top of light fixtures and air outlets to allow for access to light fixtures and air outlets without removing horizontal piping. Route all sprinkler piping and provide all offsets, bends, and elbows around all mechanical, electrical, and structural members as required.

D. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated otherwise. In areas with
ceilings, piping shall be routed concealed, above ceiling. In areas without ceilings, piping shall extend as high as possible.

E. Install piping free of sags and bends and with ample space between piping to permit proper insulation applications.

F. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated on the Drawings.

G. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

H. Support piping from structure. Do not support piping from ceilings, equipment, ductwork, conduit and other non-structural elements.

I. Install sprinkler piping to provide for system drainage in accordance with NFPA 13. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple and cap.

J. Verify final equipment locations for roughing in.

K. Deviations from approved "Working Plans" for sprinkler piping require written approval of the Authority Having Jurisdiction. Written approval shall be on file with the Engineer prior to deviating from the approved "Working Plans."

L. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors.

3.03 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

C. Install unions in pipes NPS 2 and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.

D. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
E. Install dielectric unions to connect piping materials of dissimilar metals in dry piping systems.

F. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to “Quality Assurance” Article.
   a. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

G. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads and Pipe Fitter’s Handbook. Join pipe, fittings, and valves as follows:
   1. Note the 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.
   2. Align threads at point of assembly.
   3. Apply appropriate tape or thread compound to the external pipe threads.
   4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
   5. Damaged Threads: Do not use pipe with threads that are corroded, or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

H. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9. Align flanged surfaces parallel. 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 to appropriate torque specified by the bolt manufacturer.

I. Mechanical Grooved Joints: Roll grooves on pipe ends dimensionally compatible with the couplings. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

J. Joints for other piping materials are specified within the respective piping system sections.

3.04 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire department connection.
B. Install connections between 18- and 36-inches above finished grade and as indicated on the Drawings.

C. Grout or caulk pipe penetration in exterior wall.

D. Provide minimum 36-inch working clearance around connection for fire department access.

E. Install automatic (ball drip) drain valve at each check valve for fire department connection. The drain line shall discharge to the exterior.

F. Install two protective pipe bollards on sides of each fire department connection. Comply with requirements for bollards in Division 5 Section 055000 "Metal Fabrications."

3.05 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision.

B. Supervisory Switches: Supervise valves in open position unless noted otherwise.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.

2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

3.06 PIPING PROTECTION

A. Protect piping during construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at the end of each day or whenever work stops.

3.07 PENETRATIONS

A. Fire suppression penetrations occur when piping penetrate concrete slabs, concrete or masonry walls, or fire / smoke rated floor and wall assemblies.

B. Above Grade Concrete or Masonry Penetrations

1. Provide sleeves for pipes passing through above grade concrete or masonry walls, concrete floor or roof slabs. Sleeves are not required for core drilled holes in existing masonry walls, concrete floors or roofs. Provide sleeves as follows:

   a. Provide schedule 40 galvanized steel pipe for sleeves smaller than 6 inches in diameter.
b. Provide galvanized sheet metal for sleeves 6 inches in diameter and larger, thickness shall be 10 gauge (0.1382 inches).

c. Provide welded galvanized sheet metal for rectangular sleeves with the following minimum metal thickness:

1) For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 18 gauge (0.052 inches).

2) For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 10 gauge (0.1382 inches).

d. Schedule 40 PVC pipe sleeves are acceptable for use in areas without return air plenums.

2. Seal elevated floor, exterior wall and roof penetrations watertight and weathertight with non-shrink, non-hardening commercial sealant. Pack with mineral wool and seal both ends with minimum of ½” of sealant.

C. Elevated Floor Penetrations of Waterproof Membrane:

1. Provide cast-iron wall pipes for sleeves, extend top of wall pipe minimum 1” above finish floor. Size wall pipe for minimum ½” annular space between pipe and wall pipe.

2. Extend pipe insulation for insulated pipe through wall pipe. The vapor barrier shall be maintained. Size wall pipe for a minimum of 1” annular clear space between inside of sleeve and outside of insulation.

3. Pack with mineral wool and seal both ends with minimum of ½” of waterproof sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.

4. Secure waterproof membrane flashing between clamping flange and clamping ring. Comply with requirements for flashing specified in Division 7 Section "Sheet Metal Flashing and Trim."

D. Interior Foundation Penetrations: Provide sleeves for horizontal pipe passing through or under foundation. Sleeves shall be cast iron soil pipe two nominal pipe sizes larger than the pipe served.

E. Concrete Slab on Grade Penetrations:

1. Provide schedule 40 PVC pipe sleeves for vertical pressure pipe passing through concrete slab on grade. Sleeves shall be one
nominal pipe size larger than the pipe served and two pipe sizes larger than pipe served for ductile iron pipes with restraining rods. Seal water-tight with silicone caulk.

2. Provide 1/2-inch thick cellular foam insulation around perimeter of non-pressure pipe passing thru concrete slab on grade. Insulation shall extend to 2-inch above and below the concrete slab.

F. Interior Penetrations of Non-Fire-Rated Walls: Seal annular space between sleeve and pipe or duct, using joint sealant appropriate for size, depth, and location of joint. Pack with mineral wool and seal both ends with minimum of 1/2-inch of sealant. Refer to Division 21 Section “Common Work Results for Fire Suppression” for materials and installation.

1. Extend pipe insulation for insulated pipe through sleeve. The vapor barrier shall be maintained. Size sleeve for a minimum of 1-inch annular clear space between inside of sleeve and outside of insulation.

G. Exterior Wall Penetrations: Seal annular space between sleeve and pipe or duct, using joint sealant appropriate for size, depth, and location of joint. Pack with mineral wool and seal both ends with minimum of 1/2-inch of waterproof sealant. Refer to Division 07 Section “Joint Sealants” for materials and installation.

1. Extend pipe insulation for insulated pipe through sleeve. The vapor barrier shall be maintained. Size sleeve for a minimum of 1-inch annular clear space between inside of sleeve and outside of insulation.

H. Fire / Smoke Rated Floor and Wall Assemblies: Seal around penetrations of fire rated assemblies to maintain fire resistance rating of assemblies. Coordinate fire ratings and locations with the architectural drawings. Install sealants in compliance with the manufacturer's UL listing. Refer to Division 21 Section “Common Work Results for Fire Suppression” for firestopping and materials.

1.

3.08 PIPE FIELD QUALITY CONTROL

A. Testing: Refer to individual piping system specification sections.

END OF SECTION
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SECTION 21 05 53
IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Extent of Fire Suppression work to be identified as required by this Section is indicated on drawings and/or specified in other Division 21 Sections.

B. Types of identification devices specified in this Section include the following:

1. Equipment labels.
2. Valve tags.
3. Warning tags.

C. Related Sections

1. Division 21 Section 210010 "General Fire Suppression Requirements" for requirements for hydraulic calculations, fire flow test data, obtaining electronic drawings files, shop drawings and record drawings.

2. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.

3. Division 21 Section 210515 "Basic Fire Suppression Piping Material and Methods," for general piping and fitting materials and methods.

4. Division 21 Section 211100 "Fire Suppression Water Service Piping," for fire suppression piping starting 5 feet outside the building to within the building.

5. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire-suppression sprinkler systems inside the building.

1.02 CODES AND STANDARDS:

A. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

B. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

B. Maintenance Data: For each piping system to include in maintenance manuals.

PART 2 PRODUCTS

2.01 EQUIPMENT LABELS

A. Metal Labels for Equipment:
   1. Material and Thickness: Brass, aluminum, or anodized aluminum, 0.032 inch thick, with predrilled holes for attachment hardware.
   2. Background/Letter Color: Red/White or Bare Metal/Black.
   3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   4. 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.
   5. Fasteners: Stainless-steel rivets or self-tapping screws.
   6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
   2. Background/Letter Color: Red/White
   3. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch
   5. 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. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number,

2.02 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping-system abbreviation and 1/2-inch (13-mm) numbers.

1. Tag Material: Brass, stainless steel, aluminum or anodized aluminum, 0.032 inch thick, with predrilled holes for attachment hardware.

2. Fasteners: Brass wire-link chain, beaded chain or S-hook.


2.03 HYDRAULIC PLACARDS

A. Provide hydraulic calculation placard attached to each riser in accordance with NFPA 13. Placard shall include location of design area or areas, discharge densities over the design area or areas, required flow and pressures at the base of riser, occupancy classification and maximum permitted storage height and configuration, hose stream allowance included in addition to the sprinkler demand and name of installing contractor. Information shall be permanently and clearly displayed on placard.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT IDENTIFICATION

A. General: Install metal or plastic equipment marker on or near each major item of fire protection equipment and each operational device, as specified
herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:

1. Backflow Preventers

3.03 VALVE-TAG INSTALLATION
A. Install tags on valves and control devices in fire suppression systems

3.04 LABEL INSTALLATION
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 or permanently fasten labels on each major piece of equipment.
D. Locate equipment labels where accessible and visible.

END OF SECTION
SECTION 21 11 00

FIRE SUPPRESSION WATER SERVICE PIPING

PART 1 GENERAL

1.01 SUMMARY

A. The extent of this fire suppression water service piping shall be as specified herein. Contractor shall be responsible for preparation of design drawings, fabrication and installation for complete fire suppression water service piping for the building.

B. This section specifies:

1. Materials and equipment for fire suppression water service piping and related components starting 5-feet outside the building and the following:
   a. Service entrance piping through floor into the building.

C. This section includes:

1. Pipe and fittings
2. Valves
3. Post indicating valves
4. Backflow preventers
5. Fire department connection
6. Alarm devices
7. Accessories

D. Provide facility fire suppression water service piping during construction in accordance with code.

E. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 21 Specifications Sections, apply to this section.

F. Related Sections:

1. Division 31 Section "Earthwork," for trenching and backfilling materials and methods for underground piping installations.
2. Division 33 Section "Water Service Systems," for water service piping beginning from 5'-0" outside the building and extending to the water service line.

3. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, fire flow test data, obtaining electronic drawings files, shop drawings and record drawings.

4. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.

5. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.

6. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire suppression sprinkler systems inside the building.

1.02 SUBMITTALS

A. Submit shop drawings prepared in accordance with Division 21 Section 210010 “General Fire Suppression Requirements.”

1.03 QUALITY ASSURANCE

A. Contractor shall be responsible for all permits and fees associated with preparation and approval of Drawings and the installation and approval of the Facility Fire Suppression Water Service Piping.

B. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.

2. Comply with standards of authorities having jurisdiction for fire suppression water service piping, including materials, hose threads, installation, and testing.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.


1.04 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves according to the following:
1. Ensure that valves are dry and internally protected against rust and corrosion.

2. Protect valves against damage to threaded ends and flange faces.

3. Set valves in best position for handling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.

2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

PART 2 PRODUCTS

2.01 GENERAL

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for general piping fittings and piping specialty requirements.

2.02 DUCTILE-IRON PIPE AND FITTINGS.

A. Mechanical-Joint, Cement Lined Ductile-Iron Pipe: AWWA C151/C104, with mechanical-joint bell and plain spigot end.

B. Mechanical-Joint, Cement Lined Ductile-Iron Fittings: AWWA C110/C104, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Flanges: ASME B16.1, Class 125, cast iron.

D. Ductile-Iron Deflection Fittings:
   1. Description: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-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.
   2. Pressure Rating: 250 psig minimum.

2.03 SERVICE ENTRANCE ASSEMBLY

A. At Contractor’s option, the service entrance is permitted to utilize a one-piece riser assembly to enter the building.
   1. Assembly shall be Ames Fire and Waterworks Series IBR or approved equivalent. In-Building Riser shall be composed of a single extended 90 degree fitting of fabricated 304 stainless steel tubing, maximum working pressure 200 psi. The fitting shall have a grooved-end connection on the outlet (building) side and a CIPS coupler on the inlet (underground) side. The grooved end shall include a coupler and cap to facilitate testing of the underground piping.

2.04 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density PE film of 0.008-inch (0.20-mm) or High-density, cross-laminated PE film of 0.004-inch (0.10-mm) minimum thickness.

C. Form: Sheet or tube.

2.05 CURB VALVES

A. Curb Valves: Comply with AWWA C800 for high pressure service line valves. Valve has bronze body, ground-key plug or ball, wide tee head, and inlet and outlet matching service piping material.

B. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
1. **Shutoff Rods**: Steel; with tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

C. **Meter Valves**: Comply with AWWA C800 for high pressure service line valves. Include angle- or straight-through-pattern bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

### 2.06 GATE VALVES

**A. UL Listed or FM Approved Gate Valves:**

1. **UL listed or FM approved, Iron, Non-rising Stem Gate Valves:**
   
   a. **Description**: Iron body and bonnet, bronze seating material, and inside screw.
   
   
   c. **Pressure Rating**: 175 psig minimum.
   
   d. **End Connections**: Mechanical or push-on joint.
   
   e. **Indicator-Post Flange**: Include on valves used with indicator posts.

2. **UL-Listed or FM-Approved, Iron, OS&Y, Gate Valves:**

   a. **Description**: Iron body and bonnet and bronze seating material.
   
   
   c. **Pressure Rating**: 175 psig minimum.
   
   d. **End Connections**: Flanged or grooved.

### 2.07 GATE VALVE ACCESSORIES AND SPECIALTIES

**A. Valve Boxes**: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5-inches (125 mm) in diameter.

1. **Operating Wrenches**: Steel; with tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
2.08 CHECK VALVES
A. UL listed or FM approved Check Valves:
   1. Description: Swing-check type with pressure rating, rubber-face checks unless otherwise indicated, and ends matching piping.

2.09 BACKFLOW PREVENTERS
A. Double Check Detector Backflow Preventer Assembly:
   2. Operation: Continuous-pressure applications.
   3. Body Material: Cast iron with interior lining complying with AWWA C550 or that is FDA approved; Steel with interior lining complying with AWWA C550 or that is FDA approved; or Stainless steel.
   4. End Connections: Threaded, flanged or grooved.
   5. Accessories:
      a. Supervised butterfly or OS&Y gate valves. Backflow preventer and valves shall be listed as an assembly.
      b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

PART 3 EXECUTION

3.01 EARTHWORK
A. Comply with excavating, trenching, and backfilling requirements in Section 312000 "Earth Moving."

3.02 PREPARATION FOUNDATION FOR BELOW GROUND WATER DISTRIBUTION PIPE AND FITTINGS
A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe.
B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated elevation.

C. Pipe Beds:

1. Ductile Iron Pipe: Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation. Provide first layer of pea gravel backfill 6-inch above pipe, tamp backfill with mechanical tamper to 85% to 95% compaction. For piping with rock trench bottoms, provide sand pipe bed 6-inch underneath and around sides of pipe up to middle half of the pipe, including fittings.

D. Provide backfill above top of pipe bed as required for field conditions. Refer to Division 21 Section 210010 "General Fire Suppression Requirements" for materials and methods for backfill.

3.03 PIPE APPLICATIONS

A. Piping below grade: Provide cement lined ductile iron pipe and fittings with mechanical joints.

3.04 PIPING INSTALLATION

A. Comply with NFPA 24 for fire service main piping materials and installation.

B. Water main connection: Arrange with water utility company for tap of size and in location indicated in water main or tap water main according to the requirements of the water utility company.

C. Install ductile-iron, water service piping according to AWWA C600 and AWWA M41.

D. Bury piping with depth of cover over top of piping at least 30-inches, with top at least 12-inches below level of maximum frost penetration, and according to the following:

1. Under Driveways: With at least 36-inches of cover over top.

2. Under Railroad Tracks: With at least 48-inches of cover over top.

E. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

F. Extend fire suppression water service piping and connect to water supply source and building fire suppression water service piping systems at locations and pipe sizes indicated.
1. Terminate fire suppression water service piping at building floor slab until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building’s fire suppression water service piping systems when those systems are installed.

G. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

H. Comply with requirements in Section 211313 “Water-Based Fire Suppression Systems,” for fire suppression water piping inside the building.

I. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210515 “Basic Fire Suppression Piping Materials and Methods.”

J. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210515 “Basic Fire Suppression Piping Materials and Methods.”

K. Make connections between underground and aboveground piping using an approved transition piece strapped or fastened to prevent separation.

3.05 JOINT CONSTRUCTION

A. See Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for general joint construction requirements.

B. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

C. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.


E. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.

3.06 VALVE INSTALLATION

A. See Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for general valve installation requirements.

B. UL-Listed or FM-Approved Gate Valves: Comply with NFPA 24. Install each underground valve(s) in vaults with stem pointing up.
C. UL-Listed or FM-Approved Valves Other Than Gate Valves: Comply with NFPA 24.

D. Support valves and piping, not direct buried, on concrete piers. Comply with requirements for concrete piers in Division 03.

3.07 BACKFLOW PREVENTER INSTALLATIONS

A. Install backflow preventer at each fire protection entry in compliance with the plumbing code and Authority Having Jurisdiction. Locate in an accessible and testable location.

B. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

D. Do not install bypass piping around backflow preventers.

E. Support NPS 2-1/2 and larger backflow preventers with pipe supports attached to the floor with anchor bolts where indicated on the drawings.

F. Test backflow preventer per requirements of plumbing or division of cross connection control official.

1. Reports: Prepare backflow preventer test reports signed by the plumbing or division of cross connection control official and turn over to the Architect upon completion of the project.

3.08 POST INDICATOR VALVE

A. Install post indicator valve on the building wall, as indicated on the Drawings. Post indicator valve shall be electronically supervised-open.

3.09 FIELD QUALITY CONTROL

A. Flush, test, and inspect in accordance with NFPA 24.

B. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.

C. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.

1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2
quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Replace piping system components that do not pass the test procedures specified, and retest repaired portion of the system.

3.10 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground fire suppression water service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

3.11 CLEANING

A. Clean fire suppression water service piping as follows:

1. Flush new piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use flushing procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

B. Prepare reports of flushing activities.

END OF SECTION
PART 1  GENERAL

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

1.02 SUMMARY
A. This Section includes clean-agent extinguishing systems and the following:
   1. Piping and piping specialties.
   2. Extinguishing-agent containers.
   3. Extinguishing agent.
   5. Control and alarm panels.
   6. Accessories.
   7. Connection devices for and wiring between system components.
   8. Connection devices for power and integration into building’s fire alarm system.

1.03 REFERENCES

1.04 SYSTEM DESCRIPTION
A. Provide an engineered HFC-227ea clean-agent fire-extinguishing system for total flooding of the hazard area (including the area below the raised floor).

1.05 PERFORMANCE REQUIREMENTS
A. Design clean-agent extinguishing system and obtain approval from authorities having jurisdiction. Design system for Class C fires as appropriate for areas being protected and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas.
B. Performance Requirements:

1. HFC-227ea:
   a. Discharge clean agent no less than 6 seconds and no greater than 10 seconds and maintain 7.0% concentration by volume at 70 deg F (21 deg C) for a minimum 10-minute holding time in hazard areas. System design concentrations shall not exceed the PBPK modeling maximum exposure limit concentration level of 9.0%, by volume, unless provisions for room evacuation, before agent release, are provided.
   b. Clean agent concentration in occupied hazard areas greater than 9.0% immediately after discharge or less than 7.0% throughout the holding time will not be accepted.

C. Verified Detection: Devices located in single zone. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating second-detection device.

D. System Operating Sequence: As follows:

1. Activation of the first smoke detector shall cause the following actions:
   a. Audible and visible 'alarm' indication at control panel.
   b. Energize fire alarm bell or horn/strobe (slow cadence) in protected area.
   c. Send supervisory signal to the building fire alarm control panel.

2. Activation of a second smoke detector shall cause the following actions:
   a. Audible and visible 'pre-discharge' indication at control panel.
   b. Energize horn/strobe (fast cadence) in protected area.
   c. Shut down air-conditioning and ventilating systems serving protected area and close mechanical system dampers.
   d. Start 30-second time delay for extinguishing-agent discharge. Agent will discharge at the end of the time delay unless the abort switch is activated.
   e. Send alarm signal to building fire alarm control panel to activate notification appliances throughout building.

3. Agent discharge shall cause the following actions:
a. Audible and visible 'agent discharge' indication at control panel.
b. Energize horn/strobe (steady tone) in protected area.
c. Energize strobe outside the protected area.
d. General building notification appliances will continue to operate.
e. Air-conditioning and ventilating systems shall remain shut down.

4. Activation of the manual release stations shall cause the following actions:
   a. Audible and visible 'manual' indication at control panel.
   b. Energize horn/strobe in protected area (fast cadence).
   c. Shut down air-conditioning and ventilating systems serving protected area and close mechanical system dampers.
   d. Start 10-second time delay for extinguishing-agent discharge. Agent will discharge at the end of the time delay unless the abort switch is activated.
   e. Send alarm signal to building fire alarm system to activate notification appliances throughout building.

5. Operating abort switches will delay extinguishing-agent discharge while being activated. System must be reset before releasing switch to prevent agent discharge. Release of hand pressure on the switch while the system is still in alarm will cause the system to perform the manual release functions listed above.

1.06 SUBMITTALS

A. Product Data: For the following:
   1. Extinguishing-agent containers.
   2. Extinguishing agent.
   3. Discharge nozzles.
   4. Control panels.
   5. Detection devices.
   7. Switches.
9. Pipe hangers and supports, including seismic restraints.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Include design calculations. Include the following for hazard-area enclosure, drawn to scale:
   
   1. Plans, elevations, sections, details, and attachments to other work. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   
   2. Wiring Diagrams: Power, signal, and control wiring.
   
   3. Design Calculations: For weight, volume, and concentration of extinguishing agent required for each hazard area.
   
   4. Reflected Ceiling Plans: Show ceiling penetrations, ceiling-mounted items, and the following:
      
      a. Extinguishing-agent containers, piping, discharge nozzles, detectors, and accessories.
      
      b. Method of attaching hangers to building structure.
      
      c. Other ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
   
   5. Occupied Work Area Plans: Show the following:
      
      a. Controls and alarms.
      
      b. Extinguishing-agent containers, piping and discharge nozzles if mounted in space, detectors, and accessories.
      
      c. Equipment and furnishings.
   
   6. Access Floor Space Plans: Show the following:
      
      a. Extinguishing-agent containers, piping, discharge nozzles, detectors, and accessories.
      
      b. Method of supporting piping.
   
   C. Permit Approved Drawings: Working plans, prepared according to NFPA 2001, that have been approved by authorities having jurisdiction. Include design calculations.
   
   D. Field quality-control test reports.
   
   E. Maintenance Data: For components to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who
is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of clean-agent extinguishing systems that are similar to those indicated for this Project in material, design, and extent.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of clean-agent extinguishing systems 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.

1.08 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.

   1. Detection Devices: Not less than 20 percent of amount of each type installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles were titles below introduce lists, the following requirements apply to product selection:

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

   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 PIPING MATERIALS

A. Refer to Part 3 piping applications Article retained for applications of pipe, tube, fitting, and joining materials.

B. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 2001, Section "Distribution," for charging pressure of system.

2.03 PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, Type S, Grade B or ASTM A 106, Grade B; Schedule 40, or Schedule 80, seamless steel pipe.

   1. Threaded Fittings:
2.04 VALVES

A. General: Brass; suitable for intended operation.

B. Container Valves: With rupture disc or solenoid and manual-release lever, capable of immediate and total agent discharge and suitable for intended flow capacity.

C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure relief device.

D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

2.05 EXTINGUISHING-AGENT CONTAINERS

A. The containers used in clean agent systems shall be designed to meet the requirements of the I.S. Department of Transportation or the Canadian Transport commission, if used as shipping containers. If not shipping containers, they shall be designed fabricated, inspected, certified, and stamped in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code. The design pressure shall be suitable for the max-
mum pressure developed at 130 degree F or at the maximum controlled temperature limit.

2.06 FIRE-EXTINGUISHING CLEAN AGENT

A. Clean Agent: HFC 227ea (heptafluoropropane).

1. Manufacturers:
   a. Fike Corporation
   b. Siemens
   c. Kidde-Fenwal, Inc.
   d. SimplexGrinnell
   e. 3M
   f. Ansul
   g. Approved Equal – Submit request for consideration as an equal prior to bid

2.07 DISCHARGE NOZZLES

A. Equipment manufacturer's standard one-piece brass or aluminum alloy of type, discharge pattern, and capacity required for application.

2.08 CONTROL PANELS

A. Description: FMG approved or NRTL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system.

B. Power Requirements: 120/240-V ac; with electrical contacts for connection to system components and fire alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.

C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.

   1. Mounting: Surface.

D. Supervised Circuits: Separate circuits for each independent hazard area.

   1. Detection circuits equal to the required number of zones, or addressable devices assigned to the required number of zones.
   3. Alarm circuit.
5. Abort circuit.

E. Provide the following control-panel features:

1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
2. Automatic switchover to standby power at loss of primary power.
3. Storage container, low pressure indicator.
4. Service disconnects to interrupt system operation for maintenance with visual status indication on the annunciator panel.

F. Standby Power: Lead-acid or nickel-cadmium batteries with capacity to operate system for 72 hours and alarm for minimum of 15 minutes. Include automatic battery charger, with varying charging rate between trickle and high depending on battery voltage, that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, and suitable enclosure.

2.09 DETECTION DEVICES

A. Description: Comply with NFPA 2001 and NFPA 72, and include the following types:

1. Photoelectric Detectors: Comply with UL 268, consisting of LED light source and silicon photodiode receiving element.
2. Signals to the Building Fire Alarm Control Panel: Any type of local system trouble, supervisory, or alarm is reported to the building fire alarm control panel.

2.10 MANUAL RELEASING STATIONS

A. General Description: Flush mounted FMG approved or NRTL listed, with clear plastic hinged cover, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.

B. Manual Release: "MANUAL RELEASE" caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.

C. Abort Switch: "ABORT" caption, momentary contact, with green finish.

2.11 SWITCHES

A. Description: FMG approved or NRTL listed, where available, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.

1. Low-Agent Pressure Switches: Pneumatic operation.
2.12 NOTIFICATION APPLIANCES
   A. Description: FMG approved or NRTL listed, low voltage, and surface mounting, unless otherwise indicated.
      1. Horns: 90 to 94 dBA.
      2. Strobe Lights: Translucent lens, with "AGENT" or similar caption.

2.13 ELECTRICAL POWER AND WIRING
   A. Electrical power, wiring, and devices are specified in Division 16.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Examine areas and conditions, with Installer present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting work performance.
      1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PIPING APPLICATIONS
   A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.
   B. Fittings Working Pressure: 620 psig (4278 kPa) minimum.
   C. Flanged Joints: Class 300 minimum.
   D. NPS 2 (DN 50) and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded joints.

3.03 PIPING APPLICATIONS
   A. Piping Downstream from Orifice Union:
      1. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.
      2. Fittings Working Pressure: 1000 psig (6900 kPa) minimum.
      3. Flanged Joints: Class 300 minimum.
      4. All Sizes: Schedule 40 or 80, as required by application, steel pipe; forged-steel welding fittings; and welded joints.

3.04 CLEAN-AGENT EXTINGUISHING PIPING INSTALLATION
   A. Install clean-agent extinguishing piping and other components level and plumb and according to manufacturers’ written instructions.
B. Refer to Division 23 Section "Basic Piping Materials and Methods" for basic pipe installation and joint construction.

C. Grooved Piping Joints: Groove pipe ends according to AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant according to manufacturer's written instructions.

D. Install extinguishing-agent containers anchored to substrate.

E. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 2001, Section "Distribution," and in ASME B31.1.
   1. Install valves designed to prevent entrapment of liquid or install pressure relief devices in valved sections of piping systems.
   2. Support piping using supports and methods according to NFPA 13 and Division 15 Section "Hangers and Supports."
   3. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.

3.05 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to extinguishing-agent containers to allow service and maintenance.

C. Connect electrical devices to control panel and to building's fire alarm system. Electrical power, wiring, and devices are specified in Division 28 Section "Digital, Addressable Fire Alarm Systems."

3.06 LABELING

A. Install labeling on piping, extinguishing-agent containers, other equipment, and panels according to NFPA 2001.

B. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected with a clean-agent fire extinguishing system.

C. Install signs at entry doors to advise persons outside the room the meaning of the horn(s), bell(s), and strobe light(s) outside the protected space.

3.07 FIELD QUALITY CONTROL

A. Perform field-acceptance tests of each clean-agent extinguishing system when installation is complete. Perform system testing only after hazard-area enclosure construction has been completed and openings sealed. Comply with operating instructions and procedures of NFPA 2001, Sec-
tion "Approval of Installations." Include the following to demonstrate compliance with requirements:

1. Check mechanical items.
2. Inspect extinguishing-agent containers and extinguishing agent, and check mountings for adequate anchoring to substrate.
3. Check electrical systems.
5. Perform functional pre-discharge test.
7. Check remote monitoring operations.
8. Check control-panel primary power source.
9. Perform "puff" test on piping system, using nitrogen.

B. Correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be corrected or does not perform as specified and indicated, then retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

C. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.08 CLEANING

A. Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, using a suitable nonflammable cleaner. Pipe network shall be free of particulate matter and oil residue before installing nozzles or discharge devices.

3.09 SYSTEM FILLING

A. Preparation:
   1. Verify that piping system installation is completed and cleaned.
   2. Check for complete enclosure integrity.
   3. Check operation of ventilation and exhaust systems.

B. Filling Procedures:
   1. Install filled extinguishing-agent containers.
   2. Energize circuits.
3. Adjust operating controls.

3.10 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain clean-agent extinguishing systems. Refer to Division 1 Section "Closeout Procedures" or "Demonstration and Training."

END OF SECTION
PART 1  GENERAL

1.01  SUMMARY

A. The extent of this fire sprinkler system shall be as specified herein. Contractor shall be responsible for preparation of design drawings, hydraulic calculations, fabrication and installation for complete fire sprinkler protection for the building.

B. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire protection valves.
3. Sprinkler pipe fittings.
4. Sprinklers.
5. Alarm devices.

C. Related Sections:

1. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, obtaining electronic drawings files, shop drawings and record drawings.
2. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.
3. Division 21 Section 210515 "Basic Fire Suppression Piping Material and Methods," for general piping and fitting materials and methods.
4. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.
5. Division 21 Section 211100 “Fire Suppression Water Service Piping” for fire suppression piping starting 5 feet outside the building to within the building.
1.02 SYSTEM DESCRIPTION

A. Fire protection system in the location or portion of the building is a Wet Pipe, and Dry Pipe System.

1. Wet Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to a water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts a fusible link or destroys a frangible device. Hose connections are included if indicated.

2. Dry Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open a dry pipe valve. Water then flows into piping and discharges from sprinklers that are open.

B. Provide system(s) as specified herein and as shown on drawings. The sprinkler system shall be supplied by the underground as shown on the Drawings.

C. Provide dry pipe fire protection system for non-heated spaces and other areas of building subject to freezing including the loading docks and canopies, mansards, and balconies. Portions of systems subject to freezing or temperatures below 40° F shall be protected against freezing as required by NFPA 13. The Contractor shall be responsible for repairs and for all costs incurred from damage caused by freezing of the fire protection system.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design fire suppression system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.


C. Performance Criteria

1. Protect entire building, unless noted otherwise, with a sprinkler system designed in accordance with NFPA 13 for Light Hazard requirements.

2. Protect mechanical and electrical rooms with a sprinkler system designed in accordance with NFPA 13 for Ordinary Hazard Group 1 requirements.

3. Other Occupancy Hazard Classifications.
   a. Building Service Areas: Ordinary Hazard Group 1.
b. Automobile Parking Areas: Ordinary Hazard, Group 1.

c. Laundries: Ordinary Hazard, Group 1.


e. Office and Public Areas: Light Hazard.

4. Design Criteria for Automatic-Sprinkler Piping Design:

a. Light Hazard Occupancy:

1) Minimum Design Density: 0.10 gpm over 1,500 sq.ft. area.

2) Maximum protection area per sprinkler: 225 sq.ft.

3) Minimum Combined Hose Stream Demand Requirement: 100 gpm for 30 minutes.

b. Ordinary Hazard Group 1 Occupancy:

1) Minimum Design Density: 0.15 gpm over 1,500 sq.ft. area.

2) Maximum area per sprinkler: 130 sq.ft.

3) Minimum Combined Hose Stream Demand: 250 gpm for 60 to 90 minutes.

c. Ordinary Hazard Group 2 Occupancy:

1) Minimum Design Density: 0.20 gpm over 1,500 sq.ft. area.

2) Maximum protection area per sprinkler: 130 sq.ft.

3) Minimum Combined Hose Stream Demand: 250 gpm for 60 to 90 minutes.

d. Special Occupancy Hazard: As determined by authorities having jurisdiction.

e. Other: HIGH PILED STORAGE AREAS

1) Minimum Design Density: 0.33 gpm over 2,500-sq. ft. area.

2) Maximum protection area per sprinkler: 100 sq.ft.

3) Minimum Combined Hose Stream Demand: 500 gpm for 90 to 120 minutes.
D. The criteria listed herein shall not preclude the use of extended coverage or special application fire sprinklers designed and installed in accordance with their listing and manufacturer’s instructions.

E. The hydraulic area of operation shall be increased by 30% without revising the density for areas with sloped ceilings with a pitch exceeding 1 in 6 (16.7% slope) in accordance with NFPA 13.

F. The hydraulic area of operation shall be increased by 30% without revising the density for dry-pipe and double interlock preaction systems in accordance with NFPA 13.

1.04 SUBMITTALS

A. Submit shop drawings prepared in accordance with NFPA 13 as specified in Division 21 Section 210010 "General Fire Suppression Requirements."

1.05 QUALITY ASSURANCE

A. Contractor shall be responsible for all permits and fees associated with preparation and approval of Drawings and the installation and approval of a fire sprinkler system.

B. Tests and Inspections: Arrange, test, and pay for all tests required by code and authorities having jurisdiction.

1.06 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.07 EXTRA MATERIALS

A. Sprinkler Wrenches: Furnish to Owner, 2 sprinkler wrenches for each type of sprinkler installed.

B. Sprinklers: Furnish extra sprinklers of each style, type and finish included in the project as required by NFPA 13.

C. Sprinkler Cabinet and Wrench: Provide a finished steel cabinet(s), suitable for wall mounting, with hinged cover and space for the quantity of spare sprinklers provided plus sprinkler wrench(es).

D. Provide hydraulic calculation placard attached to each riser.
PART 2  PRODUCTS

2.01 EQUIPMENT
A. All fire protection equipment shall be UL listed and FM approved (FM Insureds only) for its intended use and in conformance with the applicable NFPA documents.

2.02 PIPE AND FITTING MATERIALS
A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for specifications on piping and fittings.

2.03 HANGERS
A. Shall be UL listed and shall meet requirements of NFPA 13 for type, dimension and location.

2.04 GENERAL DUTY VALVES
A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for specifications on general duty valves.

2.05 SPECIALTY VALVES
A. General Requirements:
   2. Pressure Rating:
   3. Body Material: Cast- or ductile- iron.
   4. Size: Same as connected piping.
   5. End Connections: Flanged or grooved.
B. Dry-Pipe Valves:
   2. Design: Differential-pressure type.
   3. Include UL 1486, quick-opening devices, trim sets for bypass, air supply, drain, priming level, alarm connections, ball drip valves, pressure gauges, drip cup assembly piped with check valve to main drain piping, priming chamber attachment, and fill-line attachment with strainer.
4. Air-Pressure Maintenance Device:
   a. **Type:** Automatic device to maintain minimum air pressure in piping.
   b. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure.

5. Air Compressor:
   a. **Standard:** UL's "Fire Protection Equipment Directory" listing.
   b. **Motor Horsepower:** Fractional.
   c. **Power:** 120-V ac, 60 Hz, single phase.
   d. Provide combination fused disconnect switch and magnetic starter.

2.06 PIPE FITTINGS

A. Branch Outlet Fittings:
   1. **Standard:** UL 213.
   2. **Pressure Rating:** 175-psig minimum.
   3. **Body Material:** Ductile-iron housing with EPDM seals and bolts and nuts.
   4. **Type:** Mechanical-T and -cross fittings.
   5. **Configurations:** Snap-on and strapless, ductile-iron housing with branch outlets.
   6. **Size:** Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
   7. **Branch Outlets:** Grooved, welded or threaded.

B. Flow Detection and Test Assemblies:
   2. **Pressure Rating:** 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.

4. Size: Same as connected piping.

5. Inlet and Outlet: Grooved or threaded.

C. Sprinkler Inspector's Test Fittings:


3. Body Material: Cast- or ductile-iron housing with sight glass.

4. Size: Same as connected piping.

5. Inlet and Outlet: Threaded.

D. Flexible Piping Systems:

1. At Contractor’s option, UL 2443 listed and FM 1637 approved (FM Insureds only) flexible piping connections to sprinklers may be used for both suspended and gypsum board ceilings when suitable for their intended use in accordance with NFPA 13. Piping shall be seismically qualified per ICC-ES AC-156 where required.

2. Description: Connections shall include a fully welded (non-mechanical fittings), braided, leak-tested sprinkler drop with a minimum internal corrugated hose diameter of 1 inch, lengths of 2 ft to 6 ft.

3. Hose Assemblies and Fittings Material: Stainless Steel

4. Ceiling Bracket:
   a. Galvanized Steel
   b. Direct attachment type, having integrated snap-on clip ends positively attached to the ceiling using tamper-resistant screws.
   c. Flexible hose attachment: removable hub type with set screw.

2.07 AUTOMATIC SPRINKLERS

A. Sprinklers: type and style as indicated or required by application. Sprinkler operating temperatures to comply with NFPA 13. Sprinklers in Light Hazard areas shall be quick response type.
B. General Requirements:


C. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.

2. Characteristics: Nominal 1/2-inch orifice with discharge coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Use sprinkler types below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.

2. Rooms with Suspended Ceilings: Recessed sprinklers.

3. Rooms with Gypsum Board Ceilings: Recessed sprinklers.


5. Spaces Subject to Freezing: Dry pendent or dry sidewall sprinklers as indicated on drawings.

E. Provide sprinkler types below with finishes indicated.

1. Finished Areas:

   a. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

   b. Upright, Pendent, and Sidewall Sprinklers: Bright chrome, with bright chrome escutcheon.

   c. Unfinished Areas: Bright chrome in unfinished spaces not exposed to view.

F. Sprinkler Guards: Provide sprinkler guard where sprinklers are less than 7-feet above finished floor; where subject to physical damage, and/or where indicated on drawings. Guard shall be UL 199 listed, wire cage type with fastening device for attaching to sprinkler.

G. Sprinkler Cabinet and Wrench: Provide a finished steel cabinet, suitable for wall mounting, with hinged cover and space for the appropriate quantity of spare sprinklers plus sprinkler wrench(es).
2.08 ALARM DEVICES

A. General: Alarm device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:
   2. Type: Vibrating, metal alarm bell.
   5. Provide engraved lamacoid plate under bell lettered “Building Fire Sprinkler System.”

C. Water Flow Indicators:
   3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory set, field-adjustable retard element to prevent false signals and tamperproof cover.
   4. Type: Paddle operated.
   6. Design Installation: Horizontal or vertical.

D. Pressure Switches:
   2. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory set, field adjustable retard element to prevent false signals and tamperproof cover.
   3. Type: Electrically supervised water flow switch with retard feature.
   5. Design Operation: Rising pressure signals water flow.

E. Valve Supervisory Switches:
2. Type: Electrically supervised.
4. Design: Signals that controlled valve is in other than fully open position.

F. Indicator Post Supervisory Switches:
2. Type: Electrically supervised.
4. Design: Signals that controlled indicator post valve is in other than fully open position.

PART 3  EXECUTION

3.01 PREPARATION
A. Perform fire hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

3.02 WATER SUPPLY CONNECTION
A. Connect sprinkler piping to water service piping for service entrance to building. Comply with requirements for exterior piping in Division 21 Section 211100 “Fire Suppression Water Service Piping.”
B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Comply with requirements for backflow preventers in Division 21 Section 211100 “Fire Suppression Water Service Piping.”
C. Wet pipe systems shall be equipped with a listed relief valve not less than ½-inch in size and set to operate at 175 psi or 10 psi in excess of the maximum system pressure, whichever is greater.

3.03 PIPE APPLICATIONS
A. Piping Below Grade: Refer to Division 21 Section 211100 “Fire Suppression Water Service Piping.”
B. Piping Above Grade:
1. Black steel and fittings for all fire sprinkler system piping located inside the building, not exposed to the elements.

2. Galvanized piping and fittings shall be used for all fire sprinkler system piping located on the exterior of the building, exposed to the elements.

3. Black Steel piping and fittings shall be used for all dry pipe fire sprinkler systems.

3.04 PIPING INSTALLATIONS

A. Refer to Division 21 Section 210515"Basic Fire Suppression Piping Materials and Methods" for general fire suppression piping installation requirements.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Hangers and Supports: Comply with the requirements of NFPA 13. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake if required by the applicable building code, designed in accordance with NFPA 13. Locate hangers at or directly adjacent to the joist panel points. Provide two nuts on threaded supports to securely fasten the support.

D. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.

E. Install pressure gauge on the riser or feed main at or near each test connection. Provide pressure gauge with a connection not less than 1/4 inch and having a soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they will not be subject to freezing.

F. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

G. Drain dry-type sprinkler system piping.

H. Fill wet-type sprinkler system piping with water.

I. Connect compressed air supply to dry pipe sprinkler piping.

J. Connect air compressor to the following piping and wiring:

1. Pressure gauges and controls.
2. Electrical power system.

3. Fire-alarm devices, including high- and low-pressure alarm.

K. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section 210515 "Basic Fire Suppression Piping Materials and Methods”

L. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section 210515 "Basic Fire Suppression Piping Materials and Methods.”

3.05 PIPE JOINT CONSTRUCTION

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for general pipe joint construction requirements.

3.06 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable water supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

3.07 SPRINKLER INSTALLATIONS

A. Use proper tools to prevent damage during installations.

B. Areas with ceilings: Install sprinklers not less than 6-inches from the edge of a ceiling tile in areas with suspended ceilings, in a symmetrical pattern with lights and outlets.

C. Install sprinklers in suspended ceilings in center or quarter point of acoustical ceiling panels, in a symmetrical pattern with lights and outlets.

D. Install sprinklers in a symmetrical pattern with lights and outlets in all other areas with ceilings.

E. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
F. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.08 IDENTIFICATION
A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment.”
B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.09 FIELD QUALITY CONTROL
A. Perform required tests and inspections.
B. Tests and Inspections:
   1. Leak Test: After installation, charge systems 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. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
   4. Energize circuits to electrical equipment and devices.
   5. Start and run air compressors.
   6. Coordinate with fire alarm tests. Operate as required.
   7. Verify that equipment hose threads are same as local fire department equipment.
C. Replace piping system components that do not pass the test procedures specified, and retest repaired portion of the system.

3.10 CLEANING
A. Clean dirt and debris from sprinklers.
B. Remove and replace sprinklers with paint other than factory finish.

3.11 DEMONSTRATION
A. Train Owner’s maintenance personnel to adjust, operate, and maintain specialty valves.
3.12 COMMISSIONING

A. Sprinkler Systems: Test per NFPA 13, NFPA 25 and local authorities requirements. Submit Contractor's Material & Test Certificates for Above Ground Piping. Submit certificates of completion to Authority Having Jurisdiction and Owner.

1. After completion of all installation, tests, etc., and prior to the opening date, the Sprinkler Subcontractor shall instruct the building personnel in the operation of the sprinkler system. Special care shall be taken to make sure the building personnel:

   a. Will immediately recognize whether the system control valves are in an 'Open' position or a 'Closed' position.

   b. Will know how to drain the system.

   c. Will know how to test the flow switches, tamper switches and alarm system.

   d. Will know how to test the dry pipe valve.

   e. Will know how to make complete weekly inspection.

   f. Will know how to perform periodic maintenance of the Fire Sprinkler System.

B. Fire Alarm Equipment: Test per NFPA 25, NFPA 72 and local authorities requirements in the presence of the Owner. Submit certificates of completion to authority having jurisdiction and Owner.

C. Preaction System: Test per NFPA 13, NFPA 25, NFPA 72 and local authorities requirements in the presence of the Owner. Submit certificates of completion to authority having jurisdiction and Owner.

END OF SECTION
PART 1  GENERAL REQUIREMENTS

1.01  DESCRIPTION OF WORK

A. This Division requires the furnishing and installing of complete functioning systems, and each element thereof, as specified or indicated on the Drawings and Specifications or reasonably inferred; including every article, device or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system’s functioning as indicated by the design and the equipment specified. Elements of the work include materials, labor, supervision, supplies, equipment, transportation, and utilities.

B. Division 22 of the Specifications and Drawings numbered with prefixes P, MP and EP generally describe these systems, but the scope of the Plumbing work includes all such work indicated in the Contract Documents: Instructions to Bidders; Proposal Form; General Conditions; Supplementary General Conditions; Architectural, Structural, Mechanical, Plumbing and Electrical Drawings and Specifications; and Addenda.

C. The Drawings have been prepared diagrammatically intended to convey the scope of work, indicating the intended general arrangement of the equipment, fixtures, piping, etc. without showing all the exact details as to elevations, offsets, control lines, and other installation requirements. The Contractor shall use the Drawings as a guide when laying out the work and shall verify that materials and equipment will fit into the designated spaces, and which, when installed per manufacturers requirements, will ensure a complete, coordinated, satisfactory and properly operating system.

1.02  QUALITY ASSURANCE

A. All work under this division shall be executed in a thorough professional manner by competent and experienced workmen licensed to perform the Work specified.

B. All work shall be installed in strict conformance with manufacturer’s requirements and recommendations. Equipment and materials shall be installed in a neat and professional manner and shall be aligned, leveled, and adjusted for satisfactory operation.

C. Material and equipment shall be new, shall be of the best quality and design, shall be current model of the manufacturer, shall be free from defects and imperfections and shall have markings or a nameplate identifying the manufacturer and providing sufficient reference to establish
quality, size and capacity. Material and equipment of the same type shall be made by the same manufacturer whenever practicable.

D. Unless specified otherwise, manufactured items shall have been installed and used, without modification, renovation, or repair for not less than one year prior to date of bidding for this project.

1.03 CODES, REFERENCES AND STANDARDS

A. Execute Work in accordance with the National Fire Protection Association and all Local, State, and National codes, ordinances and regulations in force governing the particular class of Work involved. Obtain timely inspections by the constituted authorities, and upon final completion of the Work obtain and deliver to the Owner executed final certificates of acceptance from the Authority Having Jurisdiction.

B. Any conflict between these Specifications and accompanying Drawings and the applicable Local, State and Federal codes, ordinances and regulations shall be reported to the Architect in sufficient time, prior to the opening of Bids, to prepare the Supplementary Drawings and Specification Addenda required to resolve the conflict.

C. The governing codes are minimum requirements. Where these Drawings and Specifications exceed the code requirements, these Drawings and Specification shall prevail.

D. All material, manufacturing methods, handling, dimensions, method or installation and test procedure shall conform to but not be limited to the following industry standards and codes:

- IMC: International Mechanical Code – 2006
- ADA: American Disabilities Act
- AIA: Guidelines for Design and Construction of Hospital and Healthcare Facilities
- AMCA: Air Movement and Control Association, Inc.
- ANSI: American National Standards Institute
- ASHRAE: American Society of Heating Refrigerating and Air Conditioning Engineers
- ASME: American Society of Mechanical Engineers
- ASSE: American Society of Sanitary Engineering
- ASTM: American Society of Testing Materials
- AWS: American Welding Society
- AWWA: American Water Works Association
- CISPI: Cast Iron Soil Pipe Institute
- MSS: Manufacturer’s Standardization Society of the Valve and Fitting Industry
- NBFU: National Board of Fire Underwriters
E. Contractor shall comply with rules and regulations of public utilities and municipal departments affected by connections of services.

F. All Plumbing work shall be performed in compliance with applicable safety regulations, including OSHA regulations. Safety lights, guards, shoring and warning signs required for the performance of the Plumbing work shall be provided by the Contractor.

1.04 DEFINITIONS

A. General:

1. Furnish: The term “furnish” is used to mean “supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations.”

2. Install: The term "install" is used to describe operations at the project site including the actual “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.”

3. Provide: The term “provide” means “to furnish and install, complete and ready for the intended use.”

4. Furnished by Owner or Furnished by Others: The item will be furnished by the Owner or Others. It is to be installed and connected under the requirements of this Division, complete and ready for operation, including items incidental to the Work, including services necessary for proper installation and operation. The installation shall be included under the guarantee required by this Division.

5. Engineer: Where referenced in this Division, “Engineer” is the Engineer of Record and the Design Professional for the Work under this Division, and is a Consultant to, and an authorized representative of, the Architect, as defined in the General and/or Supplementary Conditions. When used in this Division, it means increased involvement by, and obligations to, the Engineer, in addition to involvement by, and obligations to, the “Architect”.

6. AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the Work.
7. NRTL: Nationally Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA, etc.), and acceptable to the Authority having Jurisdiction (AHJ) over this project. Nationally Recognized Testing Laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other listed Manufacturers and models that meet the specified criteria.

B. The terms "approved equal", "equivalent", or "equal" are used synonymously and shall mean “accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified”. The term "approved" shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

C. The following definitions apply to excavation operations:

1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.

2. Bedding: as used in this Section refers to the compacted sand or pea gravel installed in the bottom of a pipe trench to immediately support a pipe and cover a pipe.

3. Subbase: as used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.

4. Subgrade: as used in this Section refers to the compacted soil immediately below the slab or pavement system.

5. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Architect.

6. Drainage Fill: as used in this Section refers to gravel installed to assist in the removal of underslab groundwater.

7. Building Fill: as used in this section refers to borrowed fill material of rock 1” and larger used to fill foundation excavations.

1.05 COORDINATION

A. The Contractor shall visit the site and ascertain the conditions to be encountered while installing the Work under this Division, verify all dimensions and locations before purchasing equipment or commencing work, and make due provision for same in the bid. Failure to comply with this requirement shall not be considered justification for omission,
alteration, incorrect or faulty installation of Work under this Division or for additional compensation for Work covered by this Division.

B. The Contractor shall refer to Drawings of the other disciplines and to relevant equipment drawings and shop drawings to determine the extent of clear spaces. The Contractor shall make offsets required to clear equipment, beams and other structural members; and to facilitate concealing piping and ductwork in the manner anticipated in the design.

C. The contractor shall provide materials with trim which will fit properly the types of ceiling, wall, or floor finishes actually installed.

D. The Contractor shall maintain a foreman on the jobsite at all times to coordinate his work with other contractors and subcontractors so that various components of the Plumbing systems will be installed at the proper time, will fit the available space, and will allow proper service access to the equipment. Carry on the Work in such a manner that the Work of the other contractors and trades will not be handicapped, hindered, or delayed at any time.

E. Work of this Division shall progress according to the "Construction Schedule" as established by the Prime Contractor and his subcontractors and as approved by the Architect. Cooperate in establishing these schedules and perform the Work under this Division, in a timely manner in conformance with the construction schedule so as to ensure successful achievement of schedule dates.

1.06 MEASUREMENTS AND LAYOUTS

A. The drawings are schematic in nature, but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the building. Figured dimensions shall be taken in preference to scale dimensions. Determine exact locations by job measurements, by checking the requirements of other trades, and by reviewing the Contract Documents. The Contractor will be held responsible for errors which could have been avoided by proper checking and inspection.

1.07 SUBMITTALS

A. Refer to Division 1 and General Conditions for submittal requirements, in addition to requirements specified herein.

B. Submittals and shop drawings shall not contain HEI's firm name or logo, nor shall they contain the HEI engineer's seal and signature. They shall not be copies of HEI's work product. If the Contractor desires to use elements of such product, the license agreement for transfer of information at the end of this Section must be used.

C. Assemble and submit for review manufacturer product literature for material and equipment to be furnished and/or installed under this Division.
Literature shall include shop drawings, manufacturer product data, performance sheets, samples and other submittals required by this Division[ as noted in Table 1 at the end of this Section]. Provide the number of submittals required by Division 1; if hard-copy sets are provided, submit a minimum of seven (7) sets. General product catalog data not specifically noted to be part of the specified product will be rejected and returned without review.

D. Separate submittals according to individual specification sections. Only resubmit those sections requested for resubmittal.

E. Provide submittals in sufficient detail so as to demonstrate compliance with these Contract Documents and the design concept. Highlight, mark, list or indicate the materials, performance criteria and accessories that are being proposed. Illegible submittals will be rejected and returned without review.

F. Refer to individual Sections for additional submittal requirements.

G. Transmit submittals as early as required to support the project schedule. Allow two weeks for Engineer review time, plus to/from mailing time via the Architect, plus a duplication of this time for resubmittals, if required. Transmit submittals as soon as possible after Notice to Proceed and before Plumbing construction starts.

H. Before transmitting submittals and material lists, verify that the equipment submitted is mutually compatible with and suitable for the intended use. Verify that the equipment will fit the available space and maintain manufacturer recommended service clearances. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.

I. Submittals shall contain the following information:

1. The project name.
2. The applicable specification section and paragraph.
3. Equipment identification acronym as used on the drawings.
4. The submittal date.
5. The Contractor's stamp, which shall certify that the stamped drawings have been checked by the Contractor, comply with the Drawings and Specifications, and have been coordinated with other trades.
6. Submittals not so identified will be returned to the Contractor without action.

J. Refer to Division 1 for acceptance of electronic submittals for this project. For electronic submittals, Contractor shall submit the documents in
accordance with this Section and the procedures specified in Division 1. Contractor shall notify the Architect and Engineer that the submittals have been posted. If electronic submittal procedures are not defined in Division 1, Contractor shall include the website, user name and password information needed to access the submittals. For submittals sent by e-mail, Contractor shall copy the Architect and Engineer’s designated representatives. Contractor shall allow for the Engineer review time as specified above in the construction schedule. Contractor shall submit only the documents required to purchase the materials and/or equipment in the submittal.

K. The checking and subsequent acceptance by the Engineer and/or Architect of submittals shall not relieve responsibility from the Contractor for (1) deviations from the Drawings and Specifications; (2) errors in dimensions, details, sizes of equipment, or quantities; (3) omissions of components or fittings; and (4) not coordinating items with actual building conditions and adjacent work. Contractor shall request and secure written acceptance from the Engineer and Architect prior to implementing any deviation.

L. Provide welders’ qualification certificates.

1.08 ELECTRONIC DRAWING FILES

A. In preparation of shop or record drawings, Contractor may, at their option, obtain electronic drawing files in AutoCAD or DXF format from the Engineer for a shipping and handling fee of $200 for a drawing set up to 12 sheets and $15 per sheet for each additional sheet. Contact the Architect for Architect’s written authorization. Contractor shall complete and send the form attached at the end of this Section along with a check made payable to Henderson Engineers, Inc. Contractor shall indicate the desired shipping method and drawing format on the attached form. In addition to payment, Architect’s written authorization and Engineer’s release agreement form must be received before electronic drawing files will be sent.

1.09 SUBSTITUTIONS

A. Refer to Division 1 and General Conditions for substitutions.

B. Materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution.

C. No substitution will be considered prior to receipt of Bids unless written request for approval to bid has been received by the Engineer at least ten (10) calendar days prior to the date for receipt of Bids. Each such request shall include the name of the material or equipment for which substitution is being requested, and a complete description of the proposed substitution including drawings, cut sheets, performance and test data, and all other information necessary for an evaluation. Include a statement setting forth changes in other materials, equipment or other work that incorporation of
the substitution would require. The burden of proof of the merit of the proposed substitution is upon the proposer. The Engineer's decision to approve or disapprove a substitution in a Bid is final.

D. If the proposed substitution is approved prior to receipt of Bids, such approval will be stated in an Addendum. Bidders shall not rely upon approvals made in any other manner. Verbal approval will not be given.

E. No substitutions will be considered after the Contract is awarded unless specifically provided in the Contract Documents.

1.10 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 1 and General Conditions for Operation and Maintenance Manuals.

B. Submit manuals prior to requesting the final punch list and before all requests for Substantial Completion.

C. Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division.

D. Prior to Substantial Completion of the project, furnish to the Architect, [for Engineer's review,] and for the Owner's use, four (4) copies of Operation and Maintenance Manuals in labeled, hard-back three-ring binders, with cover, binding label, tabbed dividers and plastic insert folders for Record Drawings. Include local contacts, complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications.

E. Each manual shall contain [data listed in Table 5] [equipment data, approved submittals, shop drawings, diagrams, capacities, spare part numbers, manufacturer service and maintenance data, warranties and guarantees].

F. Refer to Division 1 for acceptance of electronic manuals for this project. For electronic manuals, Contractor shall submit the documents in accordance with this Section and the procedures specified in Division 1. Contractor shall notify the Architect and Engineer that the manuals have been posted. If electronic manual procedures are not defined in Division 1, Contractor shall include the website, user name and password information needed to access the manuals. For manuals sent by e-mail, Contractor shall copy the Architect and Engineer's designated representatives.

1.11 SPARE PARTS

A. Provide to the Owner the spare parts specified in the individual sections in Division 22 of this specification. Refer to Table 2 at the end of this section for a list of specification sections in Division 22 that contain spare parts requirements.
B. Owner or Owner’s representative shall initial and date each section line in Table 2 when the specified spare parts for that section are received and shall sign at the bottom when all spare parts have been received.

1.12 RECORD DRAWINGS

A. A set of work prints of the Contract Documents shall be kept on the jobsite during construction for the purpose of noting changes. During the course of construction, the Contractor shall indicate on these Documents changes made from the original Contract Documents. Particular attention shall be paid to those items which need to be located for servicing. Underground utilities shall be located by dimension, from column lines.

1.13 TRAINING

A. Provide training as indicated in each specific section. Schedule training with the Owner at least 7 days in advance. Video tape the training sessions in format as agreed to with the Owner. Provide three copies of each session to the Owner and obtain written receipt from the Owner.

1.14 PAINTING

A. Exposed ferrous surfaces, including pipe, pipe hangers, equipment stands and supports [and exposed insulated piping] shall be painted by the Plumbing Contractor using materials and methods as specified under Division 9 of the Specifications; colors shall be as selected by the Architect.

B. Factory finishes, shop priming and special finishes are specified in the individual equipment specification sections.

C. Where factory finishes are provided and no additional field painting is specified, marred or damaged surfaces shall be touched up or refinished so as to leave a smooth, uniform finish.

1.15 DELIVERY, STORAGE AND HANDLING

A. [Refer to Division 1 and General Conditions for Delivery, Storage and Handling.]

B. Equipment and material shall be delivered to the job site in their original containers with labels intact, fully identified with manufacturer's name, model, model number, type, size, capacity and Underwriter’s Laboratories, Inc. labels and other pertinent information necessary to identify the item.

C. Deliver, receive, handle and store equipment and materials at the job site in the designated area and in such a manner as to prevent equipment and materials from damage and loss. Store equipment and materials delivered to the site on pallets and cover with waterproof, tear resistant tarp or plastic or as required to keep equipment and materials dry. Follow manufacturer's recommendations, and at all times, take every precaution to properly protect equipment and material from damage, to include the erection of
temporary shelters to adequately protect equipment and material stored at the Site. Equipment and/or material which become rusted or damaged shall be replaced or restored by the Contractor to a condition acceptable to the Architect.

D. The Contractor shall be responsible for the safe storage of his own tools, material and equipment.

1.16 GUARANTEES AND WARRANTIES

A. Refer to Division 1 and General Conditions for Guarantees and Warranties.

B. Each system and element thereof shall be warranted against defects due to faulty workmanship, design or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty in the Construction Documents or manufacturer’s standard warranty. The Contractor shall remedy defects occurring within a period of one year from the date of Substantial Completion or as stated in the General Conditions.

C. The following additional items shall be guaranteed:

1. Piping shall be free from obstructions, holes or breaks of any nature.

2. Insulation shall be effective.

3. Proper circulation of fluid in each piping system.

D. The above guarantees shall include both labor and material; and repairs or replacements shall be made without additional cost to the Owner.

E. The remedial work shall be performed promptly, upon written notice from the Architect or Owner.

F. At the time of Substantial Completion, deliver to the Owner warranties with terms extending beyond the one year guarantee period, each warranty instrument being addressed to the Owner and stating the commencement date and term. Refer to Table 3 at the end of this section for a list of specification sections in Division 22 that contain special warranties.

1.17 TEMPORARY FACILITIES

A. [Refer to Division 1 and General Conditions for Temporary Facilities requirements.]

B. Temporary Utilities: The types of services required include, but are not limited to, water, sewerage, surface drainage and gas. When connecting to existing franchised utilities for required services, comply with service companies’ recommendations on materials and methods, or engage
service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations.

1. Provide the necessary backflow prevention devices where connecting to the potable water system. Protect water service from freezing by draining system or by providing adequate heat. Where non-potable water is used, mark each outlet with health hazard warning signs.

2. Sewer Sediment: Maintain sewers and temporary connecting sewers in a clean, nonclogged condition during construction period.

C. Construction Facilities: Provide facilities reasonably required to perform construction operations properly and adequately.

1. Enclosures: When temporary enclosures are required to ensure adequate workmanship, weather protection and ambient conditions required for the work, provide fire-retardant treated lumber and plywood; provide tarpaulins with UL label and flame spread of 15 or less; provide translucent type (nylon reinforced polyethylene) where daylighting of enclosed space would be beneficial for workmanship, and reduce use of temporary lighting.

1.18 PROJECT CONDITIONS

PART 2 PRODUCTS AND MATERIALS

2.01 SOIL MATERIALS

A. Provide clean sand, pea gravel or flowable fill material (per the geotechnical engineer's or structural engineer's recommendations).

B. Subbase Material: Where applicable, provide natural soils with 10% by volume of rocks less than 2” diameter or artificially crushed aggregate. Corrosive fill materials shall not be utilized. When CL clay, rock, or gravel is used, it shall not be larger than 2 inches in any dimension and be free of debris, waste, frozen materials, vegetable and other deleterious matter.

C. Drainage Fill: Provide washed, evenly graded mixture of ¾” open graded aggregate stone or gravel, around drainage pipes to a level above pipe as detailed by Architect. Provide open graded aggregate, crushed stone, crushed or uncrushed gravel with 100 percent passing a 1-1/2-inch sieve, and not more than 5 percent passing a No. 4 sieve for drainage fill to subgrade or around equipment structures.

D. Filter Fabric: Flat needle punched PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. (4,480 to 13,440 L/min. per sq. m) when tested according to ASTM D 4491.
PART 3 EXECUTION

3.01 PERMITS

A. Secure and pay for permits required in connection with the installation of the Plumbing Work. Arrange with the various utility companies for the installation and connection of required utilities for this facility and pay charges associated therewith including connection charges and inspection fees, except where these services or fees are designated to be provided by others.

3.02 EXCAVATION AND BACKFILLING

A. Refer to Division 1, Division 31 and General Conditions for Excavation and Backfilling.

B. [Perform excavation of every description, of whatever substance encountered and to the depth required in connection with the installation of the work under this Division. Excavation shall be in conformance with applicable Division and section of the General Specifications.]

C. Roads, alleys, streets and sidewalks damaged during this work shall be restored to the satisfaction of Authorities Having Jurisdiction.

D. Trenches close to walks or columns shall not be excavated without prior consultation with the Architect.

E. Erect barricades around excavations. Provide an adequate number of amber lights on or near the work and keep them burning from dusk to dawn. The Contractor shall be held responsible for any damage that any parties may sustain due to neglecting the necessary precautions when performing the work.

F. Slope sides of excavations to comply with local, state and federal codes and ordinances. Shore and brace as required for stability of excavation.

G. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local, state and federal codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

1. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.

H. Install sediment and erosion control measures in accordance with local codes and ordinances.

I. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and trenches.
1. Do not allow water to accumulate in excavations and trenches. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation and trench limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches. In no case shall sewers be used as drains for such water.

J. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

   1. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.

   2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.

K. Excavation for Underground Tanks, Basins, and Plumbing Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

   1. Excavate, by hand, areas within drip-line of large trees. Protect the root system from damage and dry-out. Maintain moist conditions for root system and cover exposed roots with burlap. Paint root cuts of 1 inch in diameter and larger with emulsified asphalt tree paint.

   2. Take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed.

L. Trenching: Excavate trenches for Plumbing installations as follows:

   1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of pipe and equipment.

   2. Excavate trenches to depth indicated or required for piping to establish indicated slope and invert elevations. Beyond building perimeter, excavate trenches to an elevation below frost line.

   3. Limit the length of open trench to that in which pipe can be installed, tested, and the trench backfilled within the same day.

   4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior
to installation of pipe. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and pipe.

5. Excavate trenches for piping and equipment with bottoms of trench to accurate elevations for support of pipe and equipment on undisturbed soil.

M. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.

N. Bedding:

1. Fill bottom of pipe trench and fill unevenness with compacted bedding material to ensure continuous bearing of the pipe barrel on the bearing surface. Additional bedding installation requirements are in the following piping specifications. Compact bedding as described below:

2. Fill bottom of equipment trench and fill unevenness with compacted sand backfill to ensure continuous bearing of the equipment on the bearing surface. Compact bedding as described below.

O. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.

2. Under building slabs, use drainage fill materials.

3. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.

4. For piping less than 30 inches below surface of roadways, provide 4-inch-thick concrete base slab support after installation and testing of piping and prior to backfilling and placement of roadway subbase. Coordinate with AHJ for colored concrete requirements.

5. Other areas, use excavated or borrowed materials.

P. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval, and locations of underground utilities have been recorded.


4. Removal of trash and debris.

Q. Drainage Fill: Where building fill is used in lieu of natural soils, provide drainage fill as subbase material. Provide filter fabric material to line the trench to support the bedding material and subbase materials to ensure that backfill materials will not segregate within the trench nor create voids and sags within the pipe trench.

R. Placement and Compaction: Place subgrade backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

S. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

T. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of piping and equipment by carrying material uniformly around them to approximately same elevation in each lift.

U. Compaction: Place bedding backfill materials in maximum layers of not more than 6 inches loose depth for material compacted by hand-operated tampers. Place subbase backfill materials in maximum layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

1. Use of pneumatic backhoe as compaction method is not allowed as an acceptable process for compaction of excavations or trenches.

2. For vertical and/or diagonal pipe installations greater than $\frac{1}{2}''$ rise/lf, thoroughly support pipes from permanent concrete structures or undisturbed earth at no less than 10-foot intervals, while placing backfill materials, so that pipes are not deflected, crushed, broken, or otherwise damaged by the backfill placement or settlement.

3. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
4. Place backfill and/or drainage fill materials evenly adjacent to structures, piping, and equipment to required elevations. Coordinate with Architect and/or Civil Engineer backfill requirements prior to installation. Prevent displacement of pipes and equipment by carrying material uniformly around them to approximately same elevation in each layer or lift.

5. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 or ASTM D 698 and not less than the following percentages of relative density, determined in accordance with ASTM D 4253, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

   a. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.

   b. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.

   c. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.

V. Subsidence: Where subsidence occurs at Plumbing installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

W. Additional Excavation: Where additional excavation may be required due to unsuitable bearing materials encountered, notify the architect immediately for resolution.

3.03 CUTTING AND PATCHING

A. The Contractor shall do necessary cutting of walls, floors, ceilings and roofs.

B. No structural member shall be cut without permission from Architect.

C. Patch around openings to match adjacent construction.
D. After the final waterproofing membrane has been installed, roofs may be cut only with written permission by the Architect.

3.04 CLEANING

A. Dirt and refuse resulting from the performance of the work shall be removed from the premises as required to prevent accumulation. The Plumbing Contractor shall cooperate in maintaining reasonably clean premises at all times.

B. Immediately prior to the final inspection, the Plumbing Contractor shall clean material and equipment installed under the Plumbing Contract. Dirt, dust, plaster, stains, and foreign matter shall be removed from surfaces including components internal to equipment. Damaged finishes shall be touched-up and restored to their original condition.

3.05 SUBSTANTIAL COMPLETION REVIEW

A. Prior to requesting inspection for "CERTIFICATE OF SUBSTANTIAL COMPLETION", the Contractor shall complete the following items:

1. Submit complete Operation and Maintenance Manuals.

2. Submit complete Record Drawings.

3. Perform special inspections. Refer to Table 4 at the end of this section for a list of specification sections in Division 22 that contain special inspection requirements.

4. Start-up testing of systems.

5. Removal of temporary facilities from the site.

6. Comply with requirements for Substantial Completion in the "General Conditions".

B. The Contractor shall request in writing a review for Substantial Completion. The Contractor shall give the Architect/Engineer at least seven (7) days notice prior to the review.

C. The Contractor's written request shall state that the Contractor has complied with the requirements for Substantial Completion.

D. Upon receipt of a request for review, the Architect/Engineer will either proceed with the review or advise the Contractor of unfulfilled requirements.

E. If the Contractor requests a site visit for Substantial Completion review prior to completing the above mentioned items, He shall reimburse the Architect/Engineer for time and expenses incurred for the visit.
F. Upon completion of the review, the Architect/Engineer will prepare a "final list" of outstanding items to be completed or corrected for final acceptance.

G. Omissions on the "final list" shall not relieve the Contractor from the requirements of the Contract Documents.

H. Prior to requesting a final review, the Contractor shall submit a copy of the final list of items to be completed or corrected. He shall state in writing that each item has been completed, resolved for acceptance or the reason it has not been completed.

END OF SECTION 220010
### TABLE 1: PLUMBING SPECIFICATION SHOP DRAWING SUBMITTAL REQUIREMENTS

<table>
<thead>
<tr>
<th>SPECIFICATION NUMBER/TITLE</th>
<th>DESIGNATION</th>
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<tr>
<td>220010 General Plumbing Requirements</td>
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<td>220015 Coordination</td>
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<td>220500 Common Work Results For Plumbing</td>
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<td>220515 Basic Piping Materials And Methods</td>
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<td>220519 Meters And Gauges For Plumbing Piping</td>
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<td>220523 General-Duty Valves For Plumbing Piping</td>
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<td>220529 Hangers And Supports For Plumbing Piping</td>
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<td>221300 Sanitary Drainage &amp; Vent Piping &amp; Specialties</td>
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<td>221400 Storm Drainage Piping &amp; Specialties</td>
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<td>221500 General Service Compressed Air Systems</td>
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<td>224000 Plumbing Fixtures</td>
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### CODED LEGEND

- **A** Shop Drawings
- **B** Product Data and equipment weights
- **C** Performance Data, Curves, Certificates and Test Data
- **D** Coordination Drawings
- **E** Wiring Diagrams and short circuit current ratings
- **F** Installation Instructions
- **G** Welder’s Certificates
- **H** Certificates
- **I** Calculations
- **J** Special Inspections
- **K** Special Warranties
- **L** Material Samples
- **M** Schedules
- **N** Recommended Spare Parts List

### TABLE 2: SPARE PARTS REQUIREMENTS FOR PLUMBING EQUIPMENT

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<thead>
<tr>
<th>Section Number</th>
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<td>221100</td>
<td>Water Distribution Piping &amp; Specialties</td>
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<td>223200</td>
<td>Domestic Water Filtration Equipment</td>
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<td>224000</td>
<td>Plumbing Fixtures</td>
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Owner’s Signature
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<th>Section Number</th>
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### TABLE 5: PLUMBING SPECIFICATION OPERATION AND MAINTENANCE SUBMITTAL REQUIREMENTS

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<tbody>
<tr>
<td>220500 Common Work Results For Plumbing</td>
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<td>220513 Common Motor Requirements For Plumbing Equipment</td>
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<tr>
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<td>223300 Electric Domestic Water Heaters</td>
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<tr>
<td>223500 Domestic Water Heat Exchangers</td>
<td>B, C, E, G, I</td>
</tr>
<tr>
<td>224000 Plumbing Fixtures</td>
<td>B, E, H, I</td>
</tr>
</tbody>
</table>

**CODED LEGEND**

A  As-Built Drawings
B  Product Data
C  Performance Data, Capacities, Curves and Certificates
D  Wiring Diagrams
E  Operating Instructions
F  Test Reports
G  Warranties
H  Recommended Spare Parts List
I  Service and Maintenance Instructions
AGREEMENT FOR TRANSFER OF INFORMATION
MACHINE-READABLE FORMAT

PROJECT NAME: ___________________________  PROJECT NO/PHASE: ___________________________

Made this day, ___________________________

By and Between Henderson Engineers, Inc. (hereinafter referred to as ENGINEER) and (hereinafter referred to as RECIPIENT).

The enclosed electronic media are provided pursuant to your request for the purpose of production of shop drawings or record drawings. In using it, modifying it, or accessing information from it, you are responsible for confirmation, accuracy, and checking of the data from the media. ENGINEER hereby disclaims any and all responsibility from any results obtained in use of this electronic media and does not guarantee any accuracy of the information.

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SECTION 22 00 15
COORDINATION

PART 1 GENERAL REQUIREMENTS

1.01 SUMMARY
A. This Section specifies the basic requirements for electrical components which are an integral part of packaged plumbing equipment. These components include, but are not limited to factory furnished motors, starters, and disconnect switches furnished as an integral part of packaged plumbing equipment.
B. Specific electrical requirements (i.e. horsepower and electrical characteristics) for plumbing equipment are scheduled on the Drawings.
C. System shall be complete and operational with power and control wiring provided to meet the design intent shown on the drawings and specified within the specification sections.

1.02 SUBMITTALS
A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification Sections.

1.03 QUALITY ASSURANCE
A. Electrical components and materials shall be UL labeled.
B. All electrical equipment provided and the wiring and installation of electrical equipment shall be in accordance with the requirements of this Section and Division 26.

PART 2 PRODUCTS AND MATERIALS

2.01 GENERAL
A. The Contractors shall provide all motors, starters, disconnects, wire, conduit, etc. as specified in the Construction Documents. If, however, the Plumbing Contractor furnishes a piece of equipment requiring a different motor, starter, disconnect, wire size, etc. than what is shown and/or intended on the Construction Documents, the Plumbing Contractor shall coordinate the requirements with any other Contractor and shall be responsible for any additional cost incurred by any other Contractor that is associated with installing the different equipment and related accessories for proper working condition.
B. Refer to Division 26, "Common Work Results for Electrical" for specification of motor connections

C. Refer to Division 26, "Enclosed Switches and Circuit Breakers" for specification of disconnect switches.

PART 3  EXECUTION

3.01  CONTRACTOR COORDINATION

A. Unless otherwise indicated, all motors, equipment, controls, etc. shall be furnished, set in place and wired in accordance with Table 1. Any items not listed but shown on the drawings shall be considered part of the Contract Documents and brought to the attention of the Architect.

B. The General Contractor is the central authority governing the total responsibility of all trade contractors. Therefore, deviations and clarifications of this schedule are permitted provided the General Contractor assumes responsibility to coordinate the trade contractors different than as indicated herein. If deviations or clarifications to this schedule are implemented, submit a record copy to the Engineer.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>FURN BY</th>
<th>SET BY</th>
<th>POWER WIRING</th>
<th>CONTROL WIRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment motors</td>
<td>DIV 22</td>
<td>DIV 22</td>
<td>DIV 26</td>
<td>---</td>
</tr>
<tr>
<td>Factory furnished motor starters, contactors and disconnects</td>
<td>DIV 22</td>
<td>DIV 26</td>
<td>DIV 26</td>
<td>DIV 23</td>
</tr>
<tr>
<td>Loose motor starters, disconnect switches, thermal overloads and heaters</td>
<td>DIV 26</td>
<td>DIV 26</td>
<td>DIV 26</td>
<td>DIV 23</td>
</tr>
<tr>
<td>Factory assembled control panels</td>
<td>DIV 22</td>
<td>DIV 26</td>
<td>DIV 26</td>
<td>DIV 23</td>
</tr>
<tr>
<td>Control relays and transformers</td>
<td>DIV 22</td>
<td>DIV 22</td>
<td>DIV 26</td>
<td>DIV 23</td>
</tr>
<tr>
<td>Thermostats (line voltage)</td>
<td>DIV 22</td>
<td>DIV 22</td>
<td>DIV 26</td>
<td>---</td>
</tr>
<tr>
<td>Time switches</td>
<td>DIV 22</td>
<td>DIV 26</td>
<td>DIV 23</td>
<td></td>
</tr>
<tr>
<td>Temperature control panels</td>
<td>DIV 22</td>
<td>DIV 22</td>
<td>DIV 26</td>
<td>DIV 23</td>
</tr>
</tbody>
</table>

DIV 22 = Plumbing Contractor
DIV 26 = Electrical Contractor
DIV 23 = Facility Management System Contractor, refer to Division 23 Section "Direct-Digital Control for HVAC".

END OF SECTION
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SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1  GENERAL REQUIREMENTS

1.01  SUMMARY

A.  This Section includes limited scope general construction materials and methods for application with Plumbing installations as follows:

1.  Access panels and doors in walls, ceilings, and floors for access to Plumbing materials and equipment.

2.  Plumbing equipment nameplate data.

3.  Concrete for bases and housekeeping pads.

4.  Non-shrink grout for equipment installations.

5.  Sleeves for Plumbing penetrations.

6.  Miscellaneous metals for support of Plumbing materials and equipment.

7.  Wood grounds, nailers, blocking, fasteners, and anchorage for support of Plumbing materials and equipment.

8.  Joint sealers for sealing around Plumbing materials and equipment.

9.  Plenum insulation for enclosure of combustible items located within fire-rated return air plenums.

B.  Related Sections: The following sections contain requirements that relate to this Section:

1.  Division 7 Section “Penetration Firestopping” for material and methods for firestopping systems.

2.  Division 22 Section "Basic piping Materials and Methods" for materials and methods for mechanical sleeve seals.

3.  Division 22 Section “Sanitary Drainage and Vent Piping and Specialties” for indirect drain piping and installation requirements.

4.  Division 23 Section “Direct Digital Controls for HVAC” for integration with facility management system of leak detection system “Water Present” alarm.
5. Division 26 Section “Common Work Results for Electrical” required electrical devices.

6. Division 26 Sections "Enclosed Switches and Circuit Breakers" for field-installed disconnects.

**1.02 SUBMITTALS**

A. General: Submit the following in accordance with Division 1 and Division 22 Section “General Plumbing Requirements”.

1. Product data for the following products:
   a. Access panels and doors.
   b. Through and membrane-penetration firestopping systems.
   c. Joint sealers.

2. Shop drawings detailing fabrication and installation for metal fabrications, and wood supports and anchorage for Plumbing materials and equipment.

3. Welder certificates, signed by Contractor, certifying that welders comply with requirements specified under "Quality Assurance" article of this Section.

4. Schedules indicating proposed methods and sequence of operations for selective demolition prior to commencement of Work. Include coordination for shut-off of utility services and details for dust and noise control.
   a. Coordinate sequencing with construction phasing and Owner occupancy specified in Division 1 Section "Summary of Work."

5. Through and Membrane Penetration Firestopping Systems Product Schedule: Provide UL listing, location, wall or floor rating and installation drawing for each penetration fire stop system.
   a. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
1.03 [LEED SUBMITTALS:]  

A. Product Data for Credit IEQ 4.1: For sealants and sealant primers used inside the weatherproofing system, documentation including printed statement of VOC content.

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. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

1.04 QUALITY ASSURANCE  

A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Fire-Resistance Ratings: Where a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating shown.

1. Provide UL Label on each fire-rated access door.

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

PART 2 PRODUCTS AND MATERIALS  

2.01 ACCESS TO EQUIPMENT  

A. Acceptable Manufacturer[s]:

1. Bar-Co., Inc.
2. Elmdor Stoneman.
3. JL Industries
6. Milcor
7. Nystrom Building Products
8. Wade
9. Zurn

B. Access Doors:

1. Provide access doors for all concealed equipment, except where above lay-in ceilings. Refer to Section “Identification for Plumbing Piping” for labeling of access doors.

2. Access doors shall be adequately sized for the devices served with a minimum size of 18 inches x 18 inches, furnished by the respective Contractor or Subcontractor and installed by the General Contractor.

3. Access doors must be of the proper construction for type of construction where installed.

4. The exact location of all access doors shall be verified with the Architect prior to installation.

5. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.

6. Frames: 16-gauge steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling.

   a. For installation in masonry, concrete, ceramic tile, or wood paneling: 1-inch-wide exposed perimeter flange and adjustable metal masonry anchors.

   b. For installation in gypsum wallboard or plaster: perforated flanges with wallboard bead.
c. For installation in full-bed plaster applications: galvanized, expanded metal lath and exposed casing bead, welded to perimeter of frame.

7. Flush Panel Doors: 14-gauge sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.

   a. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.


2.02 PLUMBING EQUIPMENT NAMEPLATE DATA

A. For each piece of power operated Plumbing equipment, provide a permanent operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliance's, and similar essential data. Locate nameplates in an accessible location.

2.03 CONCRETE EQUIPMENT BASES/HOUSEKEEPING PADS

A. Provide concrete equipment bases and housekeeping pads for various pieces of floor mounted Plumbing equipment. Concrete equipment bases/housekeeping pads shall generally conform to the shape of the piece of equipment it serves with a minimum 4" margin around the equipment and supports.

B. Form concrete equipment bases and housekeeping pads using framing lumber or steel channel with form release agent. Chamfer top edges and corners. Trowel tops and sides of each base/pad to a smooth finish, equal to that of the floors.

C. Concrete equipment bases and housekeeping pads shall be made of a minimum 28 day, 4000 psi concrete conforming to American Concrete Institute Standard Building Code for Reinforced Concrete (ACI 318-99) and the latest applicable recommendations of the ACI standard practice manual. Concrete shall be composed of cement conforming to ASTM C 150 Type I, aggregate conforming to ASTM C33, and potable water. All exposed exterior concrete shall contain 5 to 7 percent air entrainment.

D. Unless otherwise specified or shown on the structural drawings, reinforce equipment bases and housekeeping pads with No. 4 reinforcing bars conforming to ASTM A 615 or 6x6 – W2.9 x W2.9 welded wire mesh conforming to ASTM A185. Reinforcing bars shall be placed 24" on center with a minimum of two bars each direction.

E. Provide galvanized anchor bolts for all equipment placed on concrete equipment bases and housekeeping pads or on concrete slabs. Anchor
bolts size, number and placement shall be as recommended by the Manufacturer of the equipment.

F. Concrete equipment bases and housekeeping pads shall have minimum heights in accordance with the following table:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Minimum Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Heaters, Water Softeners and Equipment Less than or equal to 20 tons and Other Equipment Not Listed – Note 1</td>
<td>3-1/2&quot;</td>
</tr>
</tbody>
</table>

NOTES:

1. Height of equipment bases applies to equipment installed on slab-on-grade. For equipment installed on floors above grade and/or roof, reference the drawings.

2.04 GROUT

A. Provide nonshrink, nonmetallic grout conforming to ASTM C 1107, Grade B, in premixed and factory-packaged containers.

B. Grout shall have post-hardening, volume-adjusting, dry, non-staining, non-corrosive, non-gaseous, hydraulic-cement characteristics and shall be as recommended by manufacturer for interior and exterior applications.

C. Grout shall have 5,000 psi, 28-day compressive strength design mix.

2.05 PENETRATIONS

A. Sleeves:

1. Steel Sleeves: Schedule 40 galvanized, welded steel pipe, ASTM A-53 grade A or 12 gauge (0.1084 inches) welded galvanized steel formed to a true circle concentric to the pipe.

2. Sheet-Metal Sleeves: 10 gauge (0.1382 inches), galvanized steel, round tube closed with welded longitudinal joint.

B. Frames for rectangular openings attached to forms and of a maximum dimension established by the Architect. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, provide 18 gauge (0.052 inches) welded galvanized steel. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, provide 10 gauge (0.1382 inches) welded galvanized steel. Notify the General Contractor or Architect before installing any box openings not shown on the Architectural or Structural Drawings.
C. **Box Frames:** Frames for rectangular openings shall be of welded 12 gauge steel attached to forms and of a maximum dimension established by the Architect. Contractor shall notify the General Contractor or Architect before installing any box openings not shown on the Architectural or Structural Drawings.

2.06 **DRIP PANS**

A. Drip pans for pipes in protected areas shall be 20 gauge galvanized steel with 2” lapped and soldered joints. Drip pan shall have a depth of 2” and a width of 6” in addition to the diameter of the associated pipe. Provide 3/4” galvanized pipe with male NPT outlet at low point of drip pan.

B. Drip pan supports shall be ¼” X 2” galvanized bar stock welded to the drip pan without holes.

C. **Leak Detection System:** Rope style leak sensor and controller capable of connecting to a building automation system with audible and visual alarms for leak detection in all drip pans unless otherwise noted on drawings.

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
   
   a. Chatsworth Products, Inc.
   
   b. RLE Technologies
   
   c. Upsite Technologies
   
   d. W.E. Anderson, a division of Dwyer Instruments

2.07 **MISCELLANEOUS METALS**

A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500.

C. Hot-Rolled Steel Tubing: ASTM A 501.


E. Fasteners: Zinc-coated, type, grade, and class as required.

2.08 **MISCELLANEOUS LUMBER**

A. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.
B. Construction Panels: Plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less that 15/32 inches.

2.09 JOINT SEALERS

A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.

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.

C. Colors: As selected by the Architect from manufacturer's standard colors.

D. Elastomeric Joint Sealers: Provide the following types:

1. One-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer. Provide one of the following:

   a. "Dow Corning 790," Dow Corning Corp.
   d. "864," Pecora Corp.
   e. "Rhodia 5C," Rhone-Poulenc, Inc.
   g. "Spectrem 2," Tremco, Inc.
   h. "Dow Corning 795," Dow Corning Corp.
   i. "Rhodia 7B," Rhone-Poulenc, Inc.
   j. "Rhodia 7S," Rhone-Poulenc, Inc.
2. One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, metal or porcelain plumbing fixtures and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes. Provide one of the following:
   a. "Dow Corning 786," Dow Corning Corp.

3. LEED Compliant, One-part nonsag, neutral-curing silicone joint sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer. Provide one of the following:
   a. Dow Corning Corporation; 790.
   b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
   d. Pecora Corporation; 301 NS.
   e. Sika Corporation, Construction Products Division; SikaSil-C990.
   f. Tremco Incorporated; Spectrem 1.

E. Acrylic-Emulsion Sealants: One-part, nonsag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications on interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent. Provide one of the following:

1. Products: Subject to compliance with requirements, provide one of the following:
   b. "AC-20," Pecora Corp.
F. Latex Joint Sealant: One-part, nonsag, mildew-resistant, paintable acrylic latex or siliconized acrylic latex, complying with ASTM C 834, Type OP, Grade NF. Provide one of the following:

1. BASF Building Systems; Sonolac.
6. Tremco Incorporated; Tremflex 834.

2.10 PLENUM INSULATION

A. General: Combustible materials including, but not limited to, plastic pipe and plastic-coated cables that do not meet the minimum combustibility requirements of the applicable building codes may be installed in fire-rated return air plenums when enclosed within high-temperature insulation blanket where approved by the authority having jurisdiction.

B. Material: FyreWrap 0.5 Plenum Insulation, ETS Schaefer Plenumshield Blanket, or equivalent utilizing light weight, high temperature blanket enhanced for biosolubility. The encapsulating material shall be aluminum foil with fiberglass reinforcing scrim covering.

C. Certification: Plenum insulation shall have an encapsulated flame spread rating less than 25 and a smoke developed rating of less than 50. The product shall be UL 1887 (Modified) listed, certified by ASTM E-136 for Non-combustibility and ASTM E-84/UL 723 for Surface Burning Characteristics.

D. Physical Properties: Plenum insulation shall be single ½” layer with a density of 6 to 8 pounds per cubic foot.

PART 3 EXECUTION

3.01 INSTALLATION OF ACCESS DOORS

A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

B. Adjust hardware and panels after installation for proper operation.
3.02 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor Plumbing materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.03 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor Plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.04 PREPARATION FOR JOINT SEALERS

A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after toothing without disturbing joint seal.

3.05 APPLICATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.


B. Tooling: Immediately after sealant application and prior to time shinning or curing begins, too sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
3.06 PENETRATIONS:

A. New Construction:
   1. Coordinate with Divisions 03 and 04 for installation of sleeves and sleeve seals integrally in cast-in-place, precast, and masonry walls and horizontal slabs where indicated on the Drawings or as required to support piping or ductwork penetrations.

B. Construction in Existing Facilities:
   1. Saw cut or core drill existing walls and slabs to install sleeves and sleeve seals in existing facilities. Do not cut or drill any walls or slabs without first coordinating with, and receiving approval from, the Architect, Owner, or both. Seal sleeves and sleeve seals into concrete walls or slabs with a waterproof non-shrink grout acceptable to the Architect.

C. Provide sleeves and/or box frames for openings in all concrete and masonry construction and fire or smoke partitions, for all mechanical work that passes through such construction; Coordinate with other trades and Divisions to dimension and lay out all such openings.

D. The General Contractor will provide only those openings specifically indicated on the Architectural or Structural Drawings as being provided under the General Contractor's work.

E. The cutting of new or existing construction shall not be permitted except by written approval of the Architect.

F. Floor sleeves shall be fitted with means for attachment to forms and shall be of length to extend at least two inches above the floor level.

G. Cut sleeves to length for mounting flush with both surfaces of walls.

H. Extend sleeves installed in floors 2 inches above finished floor level.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

J. Seal space outside of sleeves with approved joint compound for penetrations of gypsum board assemblies.

K. All openings sleeved through underground exterior walls shall be sealed with mechanical sleeve seals as specified in Division 22 Section “Basic Piping Materials and Methods”.

3.07 DRIP PANS

A. Provide drip pans in locations indicated on drawings.
B. Provide drip pans for piping directly above a two hour rated ceiling of an elevator machine room.

C. Provide drip pans, only with written approval obtained prior to installation, installed beneath piping above electrical rooms, telecom rooms, data rooms, servers or any other protected area not clearly indicated by drawings.

D. Provide drip pan supports every 4'-0". Provide ¼” galvanized threaded rods through bar stock on each side of the drip pan and attached with 2 nuts per rod. Attach rods to structure with MSS SP-58 compliant components.

E. Connect ¾” type “L” copper indirect drain line to drip pan outlet. Route and discharge to receptor with air gap outside of the protected area.

F. Install leak detection rope in a zig-zag pattern covering entire length and width of the drip pan. Secure rope to pan per manufacturers recommendations.

G. Mount leak detection controller on wall adjacent to exit of the room above which the drip pan is located unless otherwise indicated on drawings indicated on drawings.

H. Coordinate disconnect and power supply for leak detection system and 120V dedicated receptacle adjacent to controller with Division 26. Power wiring and receptacles are specified in Division 26 Section “Common Work Results for Electrical” Disconnects are specified in Division 26 Section “Enclosed Switches and Circuit Breakers”

I. Coordinate interlock of “Water Present” alarm with Building Automation System. Refer to Division 23 Section “Direct Digital Controls for HVAC” for integration with facility management system and low voltage power wiring.

3.08 PLENUM INSULATION

A. General: Plenum insulation shall be installed as a single layer encapsulation applied directly on the surface of combustible items within fire-rated return air plenums where permitted by the local authority having jurisdiction.

B. Overlap: Provide a minimum 1” perimeter and longitudinal overlap at all seams and joints. Seal all cut edges with aluminum foil tape. There shall be no exposed fiber.

C. Secure Attachment: Securely attach insulation using stainless steel tie wire or banding at locations and intervals as recommended by the manufacturer. The entire installation shall comply with the manufacturer’s written installation instructions.
D. Approval: Plenum insulation shall not be installed where not allowed by local authority having jurisdiction. Do not install combustible material within fire-rated return air plenums where the use of plenum insulation is not approved.

END OF SECTION
PART 1 GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section specifies piping materials and installation methods common to more than one Section of Division 22 and includes joining materials, piping specialties and basic piping installation instructions.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 22 Section "Common Work Results for Plumbing," for materials and methods for sleeve materials.

1.02 DEFINITIONS

A. Lead Free: Refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤0.25% per Safe Drinking Water Act as amended January 4th 2011 Section 1417.

1.03 SUBMITTALS

A. Refer to Division 1 and Division 22 Section “General Plumbing Requirements” for administrative and procedural requirements for submittals.

B. Product Data: Submit product data on the following items:

1. Escutcheons
2. Dielectric Unions
3. Dielectric Waterway Fittings
4. Dielectric Flanges and Flange Kits
5. Strainers
6. Flexible Connectors

C. Quality Control Submittals:

1. Submit welders’ certificates specified in Quality Assurance below.

D. Submit third party certification that specialties and fittings for domestic water distribution comply with NSF 61 Annex G and / or NSF 372.
E. Submit a schedule of dissimilar metal joints and dielectric waterway fittings, unions, flanges or flange kits. Include joint type materials, connection method and proposed dielectric waterway fittings, unions and flanges to isolate dissimilar metals. Include minimum and maximum torque requirements for flange connections to valves. Refer to the individual piping system specification sections in Division 22 for specifications for piping materials and fittings relative to that particular system and additional requirements.

1.04 QUALITY ASSURANCE

A. Welder's Qualifications: All welders shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.


D. Pipe specialties and fittings shall be manufactured in plants located in the United States.

E. Comply with NSF 61 Annex G and / or NSF 372 for wetted surfaces of specialties and fittings containing no more than 0.25% lead by weight for domestic water distribution.

PART 2 PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide piping materials and specialties from one of the following:

1. Pipe Escutcheons:
   b. Tubular Brass Plumbing Products, Zurn Industries, Inc.

2. Dielectric Waterway Fittings:
   a. 220515.
   b. Grinnell Mechanical Products; Tyco Fire Products LP
   c. Precision Plumbing Products, Inc.

3. Dielectric Unions:
a. JOMAR International
b. Smith Cooper International
c. Watts Regulator Co.
d. Zurn Industries

4. Dielectric Flanges and Flange Kits:
a. Calpico, Inc.
b. FMC Technologies
c. Pipeline Seal & Insulator, Inc.
d. Tampa Rubber and Gasket Co., Inc.
e. Watts Industries Inc.; Water Products Div.
f. Zurn Industries, Inc.; Wilkins Div.

5. Strainers:
b. Hoffman Specialty ITT; Fluid Handling Div.
c. MEPCO
d. Metraflex Co.
e. Mueller Steam Specialties.
f. Nicholson Steam
g. RP&C Valve, Division of Conbraco Ind.
h. Spirax Sarco.
i. Watts Regulator Co.

6. Metal Flexible Connectors:
a. U.S. Hose, Corp.
b. Hyspan
c. Mason Industries, Inc.
d. Mercer Rubber Co.
e. Metraflex Co.

f. Proco Products, Inc.

g. Resistoflex

2.02 PIPE AND FITTINGS

A. Refer to the individual piping system specification sections in Division 22 for specifications on piping and fittings relative to that particular system.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

A. Refer to individual Division 22 Piping Sections for special joining materials not listed below.

B. Welding Materials: AWS D10.12; Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

C. Brazing Materials: AWS A5.8; Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials appropriate for the materials being joined.

D. Soldering Materials: ASTM B32; Refer to individual piping system specifications for solder appropriate for each respective system.

E. Gaskets for Flanged Joints: ASME B16.21; Gasket material shall be full-faced for cast-iron flanges and raised-face for steel flanges. Select materials to suit the service of the piping system in which installed and which conform to their respective ANSI Standard (A21.11, B16.20, or B16.21). Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.

2.04 PIPING SPECIALTIES

A. Escutcheons: Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings.

B. Unions:

1. Malleable-iron, Class 150 for low pressure service and class 300 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

2. Bronze, Class 125, with lead free cast bronze body meeting ASTM B584, for low pressure service and class 250 for high pressure
service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; solder or female threaded ends.

C. Dielectric Unions: Provide factory-fabricated dielectric unions with lead free cast bronze body meeting ASTM B584 and galvanized steel body with plastic dielectric gasket, class 125 for low pressure service and class 250 for high pressure service and appropriate end connections for the pipe materials in which installed (screwed or soldered).

D. Dielectric Waterway Fittings: Electroplated steel or brass nipple, with an inert and non-corrosive, thermoplastic lining.

E. Dielectric Flanges and Flange Kits:

1. Full faced gasket with same outside diameter and bolt hole arrangement as the flange. Pressure rating of 200psi for low pressure service and 400 psi for high pressure service at a continuous operating temperature of 180F.

2. Steel washers, thermoplastic washers and bolt isolation sleeves or thermoplastic combination washers and bolt sleeves.

3. Lead free cast bronze meeting ASTM B584, class 125 solder type or cast iron class 125 threaded type for low pressure service and bronze class 250 solder type or cast iron class 250 threaded type for high pressure service.

F. Y-Type Strainers: Provide strainers full line size of connecting piping, with ends matching piping system materials. Screens for 4" and smaller shall be Type 304 stainless steel mesh with 0.062" perforations and screens for 5" and larger shall be Type 304 stainless steel, with 0.125" perforations.

1. For low pressure applications, cast iron strainers shall have 125 psi working pressure rating and cast bronze and carbon steel strainers shall have 150 psi working pressure rating. For high pressure applications, cast iron strainers shall have 250 psi working pressure rating and cast bronze and carbon steel strainers shall have 300 psi working pressure rating.

2. Solder Ends, 2" and Smaller: Lead free cast bronze body meeting ASTM B584, screwed screen retainer with centered blowdown fitted with pipe plug.

3. Threaded Ends, 2" and Smaller: Cast bronze body, screwed screen retainer with centered blowdown fitted with pipe plug.

4. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.

5. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
6. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

G. Sleeves:

1. Sleeve: Refer to Division 22 Section “Common Work Results for Plumbing” for sleeve materials.

H. Mechanical Sleeve Seals: Modular Plumbing type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

I. Flexible Connectors: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections.

1. Bronze Hose, Flexible Connectors: For 2" and smaller, corrugated bronze inner tubing covered with bronze wire braid. Include ANSI 150# brass nipples with screwed connections, braised to hose.

PART 3  EXECUTION

3.01 PREPARATION

A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.02 INSTALLATIONS

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated. Refer to individual system specifications for requirements for coordination drawing submittals.

B. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated otherwise.

C. Install piping free of sags and bends and with ample space between piping to permit proper insulation applications.

D. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated on the Drawings.
E. Install horizontal piping as high as possible allowing for specified slope and coordination with other components. Install vertical piping tight to columns or walls. Provide space to permit insulation applications, with 1” clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

F. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

G. Support piping from structure. Do not support piping from ceilings, equipment, ductwork, conduit and other non-structural elements.

H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4” ball valve, and short 3/4” threaded nipple and cap.

I. Verify final equipment locations for roughing in.

3.03 PIPING PROTECTION

A. Protect piping during construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

3.04 PENETRATIONS

A. Plumbing penetrations occur when piping penetrate concrete slabs, concrete or masonry walls, or fire / smoke rated floor and wall assemblies.

B. Above Grade Concrete or Masonry Penetrations

1. Provide sleeves for pipes passing through above grade concrete or masonry walls, concrete floor or roof slabs. Sleeves are not required for core drilled holes in existing masonry walls, concrete floors or roofs. Provide sleeves as follows:

   a. Provide schedule 40 galvanized steel pipe for sleeves smaller than 6 inches in diameter.

   b. Provide galvanized sheet metal for sleeves 6 inches in diameter and larger, thickness shall be 10 gauge (0.1382 inches).

   c. Provide welded galvanized sheet metal for rectangular sleeves with the following minimum metal thickness:

      1) For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 18 gauge (0.052 inches).
2) For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 10 gauge (0.1382 inches).

d. Schedule 40 PVC pipe sleeves are acceptable for use in areas without return air plenums.

2. Extend pipe insulation for insulated pipe through floor, wall and roof penetrations, including fire rated walls and floors. The vapor barrier shall be maintained. Size sleeve for a minimum of 1” annular clear space between inside of sleeve and outside of insulation.

3. Seal elevated floor, exterior wall and roof penetrations watertight and weathertight with non-shrink, non-hardening commercial sealant. Pack with mineral wool and seal both ends with minimum of ½” of sealant.

C. Interior Foundation Penetrations: Provide sleeves for horizontal pipe passing through or under foundation. Sleeves shall be cast iron soil pipe two nominal pipe sizes larger than the pipe served.

D. Concrete Slab on Grade Penetrations:

1. Provide schedule 40 PVC pipe sleeves for vertical pressure pipe passing through concrete slab on grade. Sleeves shall be one nominal pipe size larger than the pipe served and two pipe sizes larger than pipe served for ductile iron pipes with restraining rods. Seal water-tight with silicone caulk.

2. Provide ½” thick cellular foam insulation around perimeter of non-pressure pipe passing thru concrete slab on grade. Insulation shall extend to 2” above and below the concrete slab.

E. Interior Penetrations of Non-Fire-Rated Walls: Seal annular space between sleeve and pipe or duct, using joint sealant appropriate for size, depth, and location of joint. Pack with mineral wool and seal both ends with minimum of ½” of sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.

1. Extend pipe insulation for insulated pipe through sleeve. The vapor barrier shall be maintained. Size sleeve for a minimum of 1” annular clear space between inside of sleeve and outside of insulation.

F. Exterior Wall Penetrations: Seal annular space between sleeve and pipe or duct, using joint sealant appropriate for size, depth, and location of joint. Pack with mineral wool and seal both ends with minimum of ½” of waterproof sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.
1. Extend pipe insulation for insulated pipe through sleeve. The vapor barrier shall be maintained. Size sleeve for a minimum of 1” annular clear space between inside of sleeve and outside of insulation.

G. Fire / Smoke Rated Floor and Wall Assemblies: Seal around penetrations of fire rated assemblies to maintain fire resistance rating of fire-rated assemblies. Coordinate fire ratings and locations with the architectural drawings. Install sealants in compliance with the manufacturer’s UL listing. Refer to Division 22 Section “Common Work Results for Plumbing” for firestoppings and materials.

3.05 FITTINGS AND SPECIALTIES

A. Use fittings for all changes in direction and all branch connections.

B. Remake leaking joints using new materials.

C. Install components with pressure rating equal to or greater than system operating pressure.

D. Install strainers on the supply side of each control valve, pressure reducing or regulating valve, solenoid valve, mixing valve, backflow preventer and elsewhere as indicated.

E. Install unions at the final connection to each piece of equipment adjacent to each isolation valve or valve assembly for connections 2” and smaller. Install unions where indicated elsewhere on the drawings.

F. Install flanges at the final connection to each piece of equipment, adjacent to each isolation valve or valve assembly in piping 2-1/2” and larger. Install flanges at each valve 2-1/2” and larger.

G. Install dielectric unions for piping 2” and smaller or dielectric flanges for piping 2-1/2” and larger to connect piping materials of dissimilar metals in dry piping systems (gas, compressed air, vacuum) for copper or brass connected to carbon steel, cast or ductile iron.

H. Install dielectric unions for piping 2” and smaller or dielectric flanges for piping 2-1/2” and larger to connect piping materials of dissimilar metals in wet piping systems (water) (except do not install dielectric unions in concealed spaces, instead, install dielectric waterway fittings) for copper or brass connected to carbon steel, cast or ductile iron.

I. Install dielectric waterway fittings for piping 2” and smaller for copper or brass pipe connections to carbon steel equipment connections.

J. Install dielectric flanges for piping 2-1/2” and larger for copper or brass pipe connections to carbon steel equipment connections, steel, ductile iron or cast iron valves and fittings.

K. Dielectric Flange Installation:
1. Provide brass nipples between the equipment connection and dielectric flange for screwed connections. Provide an iron flange for the equipment side and a bronze flange for the copper or brass piping side of the joint.

2. Provide a bronze flange for the copper or brass piping connection to a cast iron, ductile iron or steel flange.

3. Provide full face gasket with pressure rating equal to system served.

4. At each bolt provide, steel washers, thermoplastic washers and bolt isolation sleeves or thermoplastic combination washers and bolt sleeves.

3.06 JOINTS

A. Steel Pipe Joints:

1. Pipe 2" and Smaller: Thread pipe with tapered pipe threads in accordance with ANSI B2.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint lubricant or sealant suitable for the service for which the pipe is intended on the male threads at each joint and tighten joint to leave not more than 3 threads exposed.

2. Pipe Larger Than 2":

   a. Weld pipe joints (except for exterior water service pipe) in accordance with ASME Code for Pressure Piping, B31.

   b. Weld pipe joints of exterior water service pipe in accordance with AWWA C206.

   c. Install flanges on all valves, apparatus, and equipment. Weld pipe flanges to pipe ends in accordance with ASME B31.9 Code for Building Services Piping. Clean flange faces and install gaskets. Tighten bolts to torque specified by manufacturer of flange and flange bolts, to provide uniform compression of gaskets.

B. Non-ferrous Pipe Joints:


2. Thoroughly clean tube surface and inside surface of the cup of the fittings, using very fine emory cloth, prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux
shall not be used as the sole means for cleaning tube and fitting surfaces.

C. Joints for other piping materials are specified within the respective piping system Sections.

3.07 FLEXIBLE CONNECTORS

A. Install flexible connectors for piping system connections on equipment side of shutoff valves for all Plumbing equipment, pumps, and where indicated on Drawings.

1. Install bronze connectors for non-domestic water copper equipment connections 2” and smaller.

B. Install connectors according to manufacturer’s recommendations.

3.08 PIPE FIELD QUALITY CONTROL

A. Testing: Refer to individual piping system specification sections.

B. Inspection Report Form: Refer to the inspection report form at the end of this section for inspection data to be completed for each piping system. Submit completed forms to the Owner and Engineer.

END OF SECTION
PLUMBING & PLUMBING PIPING SYSTEMS
INSPECTION REPORT FORM

Project Name: ________________________________
Contractor Project No. __________________________
General Contractor: ____________________________
Inspection Date: ______________________________
Temperature: _________________________________

System Inspected

Building: ______________________________________
Location/Description: ___________________________
Service: ______________________________________

Inspection Results

Time of Inspection: ______________________________
Approval to Insulate: Y N
Approval to Cover in Wall: Y N
Approval to backfill Y N

Signatures

Witness: __________________________ Representing: __________________________
Witness: __________________________ Representing: __________________________
Witness: __________________________ Representing: __________________________

Remarks

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Contractor Supervisor’s signature: ________________________________
SECTION 22 05 19

METERS AND GAUGES FOR PLUMBING PIPING

PART 1  GENERAL REQUIREMENTS

1.01  SUMMARY

A. This Section includes the following types of meters and gauges:

1. Temperature gauges and fittings.
2. Pressure gauges and fittings.

1.02  SUBMITTALS

A. General: Submit the following in accordance with conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of meter and gauge. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter and gauge schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gauge.

2. Product certificates signed by manufacturers of meters and gauges certifying accuracy under specified operating conditions and products' compliance with specified requirements.

3. Maintenance data for each type of meter and gauge for inclusion in Operating and Maintenance Manuals specified in Division 1 and Division 22 Section "General Plumbing Requirements."

PART 2  PRODUCTS AND MATERIALS

2.01  MANUFACTURERS

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

1. Glass Tube Industrial Thermometers:
   a. H. O. Trerice Co.
   b. Marshalltown Instruments, Inc.
   c. Miljoco Corporation
   d. Weiss Instruments, Inc.
e. Weksler Instruments Corp.
f. Winters Instruments

2. Thermometer Wells: Same as for thermometers.

3. Pressure Gauges:
   c. Ernst Gage Co.
   d. H. O. Trerice Co.
   e. Marsh Instrument Co., Unit of General Signal.
   f. Marshalltown Instruments, Inc.
   g. Miljoco Corporation
   h. Weiss Instruments, Inc.
   i. Weksler Instruments Corp.
   j. WIKA Instruments Corp.
   k. Winters Instruments

4. Pressure Gauge Accessories: Same manufacturers as for pressure gauges.

2.02 THERMOMETERS, GENERAL

A. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

B. Scale range: Temperature ranges for services listed as follows:

1. Domestic Hot Water: 30 to 240 deg with 2-degree scale divisions (0 to 115 deg C with 1-degree scale divisions).

2.03 GLASS TUBE INDUSTRIAL THERMOMETERS

A. Case: Die cast, aluminum finished, in baked epoxy enamel, glass front, spring secured, 9 inches long.

B. Adjustable Joint: Finished to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
C. Tube: Non-red color reading, non-toxic organic spirit-filled glass tube, magnifying lens.

D. Scale: Satin-faced, nonreflective aluminum, with permanently etched markings.

E. Stem: Copper-plated steel, aluminum or brass, for separable socket, length to suit installation.

2.04 THERMOMETER WELLS

A. Thermometer Wells: Brass or stainless steel, pressure rated to match piping system design pressure; with 2-inch extension for insulated piping and threaded cap nut with chain permanently fastened to well and cap.

2.05 PRESSURE GAUGES

A. Type: General use, ASME B40.1, Grade A, phosphor bronze bourdon-tube type, bottom connection.

B. Case: Cast aluminum or stainless steel case, glass lens, 4-1/2-inches diameter.

C. Connector: Brass, 1/4-inch NPS.

D. Scale: White coated aluminum, with permanently etched markings.

E. Accuracy: Plus or minus 1 percent of range span.

F. Range: Conform to the following:
   1. All fluids: 2 times operating pressure.

G. Liquid-Filled: Provide liquid filled gauges where specified in Part 3 of this section.

2.06 PRESSURE GAUGE ACCESSORIES

A. Snubber: 1/4-inch NPS brass bushing with corrosion-resistant porous metal disc. Disc material shall be suitable for fluid served and rated pressure.

PART 3 EXECUTION

3.01 THERMOMETERS INSTALLATION

A. Install in the following locations and elsewhere as indicated:
   1. At outlet of each domestic water heater.
B. Thermometer Wells: Install in piping tee where thermometers are indicated, in vertical position. Fill well with oil or graphite and secure cap.

3.02 INSTALLATION OF PRESSURE GAUGES

A. Install in the following locations, and elsewhere as indicated:

1. Provide liquid-filled gauge at suction and discharge of each pump.

2. At building water service entrance.

B. Pressure Gauge Needle Valves: Install in piping tee with snubber.

END OF SECTION
SECTION 22 05 23

GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1  GENERAL REQUIREMENTS

1.01  SUMMARY

A.  This Section includes general duty valves common to most mechanical piping systems.

1.  Special purpose valves are specified in individual piping system specifications.

B.  Contractors Option:

1.  The Division 22 contractor may provide mechanically joined plumbing piping systems to connect mechanical joints, couplings, fittings, valves and related components as an option in lieu of, in whole or in part, copper sweat, brazing, threaded or flanged piping methods. Mechanically joined plumbing piping systems to connect plumbing piping where used shall be provided in compliance with specification Section 221111 “Mechanically Joined Plumbing Piping Systems”.

1.02  DEFINITIONS

A.  Lead Free: Refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤0.25% per Safe Drinking Water Act as amended January 4th 2011 Section 1417.

1.03  SUBMITTALS

A.  General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1.  Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

B.  Submit third party certification that valves for domestic water distribution comply with NSF 61 Annex G and/or NSF 372.

1.04  QUALITY ASSURANCE

A.  Single Source Responsibility: Provide products specified in this section from the same manufacturer where products are available and conform to the specification requirements.
B. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.

D. Valves shall be manufactured in plants located in the United States or certified that they comply with applicable ANSI, ASTM and MSS standards.

E. Comply with NSF 61 Annex G and / or NSF 372 for wetted surfaces of valves containing no more than 0.25% lead by weight compliance for valves for domestic water distribution.

**PART 2 PRODUCTS AND MATERIALS**

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products from one of the manufacturers listed in valve schedule.

2.02 VALVE FEATURES, GENERAL

A. Valve Design: Rising stem or rising outside screw and yoke stems.

1. Nonrising stem valves may be used where headroom prevents full extension of rising stems.

B. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.

C. Sizes: Same size as upstream pipe, unless otherwise indicated.

D. Operators: Provide the following special operator features:

1. Handwheels, fastened to valve stem, for valves other than quarter turn.

2. Lever handles, on quarter-turn valves 6-inch and smaller, except for plug valves. Provide plug valves with square heads; provide one wrench for every 10 plug valves.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

G. End Connections: As indicated in the valve specifications.


   a. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for gate, globe, and check valves; below 421 deg F for ball valves.

2.03 GATE VALVES

A. Gate Valves, 2-1/2-Inch and Larger: MSS SP-70; Class 125, 200-psi CWP, iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B; with flanged ends, " non-asbestos composition packing, and two-piece packing gland assembly.

B. Lead Free Gate Valves, 2-Inch and Smaller: Meeting MSS SP-80; Class 125, 200-psi CWP, body, solid wedge and bonnet of ASTM B 584 lead free cast bronze; brass packing gland and stem of ASTM B283 naval brass; with solder ends, non-asbestos composition packing, and malleable iron handwheel.

2.04 BALL VALVES

A. Lead Free Ball Valves, 2 Inch and Smaller: Meeting MSS SP-110, Class 150, 600-psi CWP; two-piece construction; with ASTM B 584 cast lead free bronze, regular port, blowout-proof stem and chrome-plated lead free brass ball with replaceable "Teflon" or "TFE" seats and seals, solder ends and vinyl-covered steel handle.

2.05 BUTTERFLY VALVES

A. Butterfly Valves, 2-1/2-Inch and Larger: MSS SP-67; 200-psi CWP; lug-type body constructed of cast-iron conforming to ASTM A 126, Class B or ductile iron conforming to ASTM A 536. Provide valves with field replaceable EPDM sleeve/seat, aluminum-bronze disc, 416 stainless steel stem, and EPDM O-ring stem seals. Provide lever operators, (10 position minimum), with lock and stops with locks for sizes 2-1/2 through 6 inches and gear operators with position indicator for sizes 8 inch and larger. Drill and tap valves on dead-end service or requiring additional body strength. Valves must be rated for dead end service at 150 psi with no downstream flange required.

2.06 CHECK VALVES

A. Lead Free Swing Check Valves, 2-Inch and Smaller: Meeting MSS SP-80; Class 125, 200-psi CWP, body and cap of ASTM B 584 cast lead free bronze; with horizontal swing, Y-pattern, disc and disc holder of ASTM B
283 alloy C46400 naval brass; solder ends. Provide valves capable of being reground while the valve remains in the line.

B. Wafer Check Valves: Class 125, cast-iron body; with replaceable bronze seat, and non-slam design lapped and balanced twin bronze flappers and stainless steel trim and torsion spring. Provide valves designed to open and close at approximately one foot differential pressure.

C. Lead Free Lift Check Valves, 2-Inch and Smaller: Meeting MSS SP-80; Class 125, 300-psi CWP, body, disc holder and cap of ASTM B 584 cast lead free bronze; horizontal or angle pattern, lift-type valve, with stainless steel spring, renewable "Teflon" disc and solder ends. Provide valves capable of being refitted and ground while the valve remains in the line.

PART 3 EXECUTION

3.01 VALVE ENDS SELECTION

A. Select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size, 2-Inch and Smaller: Solder ends.

2. Copper Tube Sizes 2-1/2 Inch and Larger: flanged end.

3.02 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

A. VALVES, 2-INCH AND SMALLER

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>BALL</th>
<th>CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Hot and Cold Water</td>
<td>125</td>
<td>150</td>
</tr>
</tbody>
</table>

B. VALVES, 2-1/2-INCH AND LARGER

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>GATE</th>
<th>BUTTERFLY</th>
<th>CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dom. Hot &amp; Cold Water</td>
<td>125</td>
<td>200</td>
<td>125</td>
</tr>
</tbody>
</table>

3.03 VALVE SCHEDULE

A. Gate Valves - 2-1/2 Inch and Larger:

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>OS&amp;Y RS</th>
<th>NRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apollo</td>
<td>611F</td>
<td>610F</td>
</tr>
<tr>
<td>Hammond</td>
<td>IR1140</td>
<td>IR1138</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>F2885</td>
<td>F-2882</td>
</tr>
<tr>
<td>Nibco</td>
<td>F617-O</td>
<td>F-619</td>
</tr>
</tbody>
</table>

B. Lead Free Gate Valves - 2 Inch and Smaller, Class 125:
C. Iron Body Ball Valves – 2-1/2” and larger, Class 125: Full Port:

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>FLANGED ENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apollo (Conbraco)</td>
<td>6P</td>
</tr>
<tr>
<td>Watts</td>
<td>G4000-FDA</td>
</tr>
</tbody>
</table>

D. Lead Free Ball Valves – 2 inch and smaller

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>SOLDER ENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apollo-(Conbraco)</td>
<td>70-LF-200</td>
</tr>
<tr>
<td>Hammond</td>
<td>UP8501</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>UPBA-150</td>
</tr>
<tr>
<td>NIBCO</td>
<td>N/A</td>
</tr>
</tbody>
</table>

E. Globe Valves - 2-1/2 Inch and Larger:

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>STRAIGHT BODY</th>
<th>ANGLE BODY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apollo</td>
<td>711F</td>
<td>x</td>
</tr>
<tr>
<td>Bray</td>
<td>CG-J</td>
<td>x</td>
</tr>
<tr>
<td>Hammond</td>
<td>IR116</td>
<td>IR118</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>F2981</td>
<td>F2986</td>
</tr>
<tr>
<td>Nibco</td>
<td>F-718-B</td>
<td>F-818-B</td>
</tr>
</tbody>
</table>

1. x means not available.

F. Lead Free Globe Valves – 2 inch and smaller, Class 125:
G. Butterfly Valves - 2-1/2 Inch and Larger:

1. The following are model numbers for lug-type, with aluminum-bronze disc:

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>LEVER</th>
<th>GEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apollo(Conbraco)</td>
<td>LD141 xx BE1*</td>
<td>LD141 xx BE2*</td>
</tr>
<tr>
<td>Bray</td>
<td>Series 31</td>
<td>Series 31</td>
</tr>
<tr>
<td>Crane Center Line</td>
<td>200XXCV061052</td>
<td>200XXCV061055</td>
</tr>
<tr>
<td>Crane</td>
<td>44BXZ3XX</td>
<td>44BXZ3GXX</td>
</tr>
<tr>
<td>Keystone</td>
<td>222</td>
<td>222</td>
</tr>
<tr>
<td>Nibco</td>
<td>LD-2000-3</td>
<td>LD-2000-5</td>
</tr>
<tr>
<td>Stockham</td>
<td>LD7DES12BS3E</td>
<td>LD7DES22BS3E</td>
</tr>
<tr>
<td>Watts</td>
<td>XXBF-03-121-15</td>
<td>XBF-03-121-1G</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>M1233E</td>
<td>M1333E</td>
</tr>
<tr>
<td>Hammond</td>
<td>6411-01</td>
<td>6411-03</td>
</tr>
<tr>
<td>* xx = Valve Size</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

H. Lead Free Swing Check Valves – 2 inch and smaller, Class 125:

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>SOLDER ENDS</th>
<th>THREADED ENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apollo</td>
<td>163S-LF</td>
<td>163T-LF</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>UP1509</td>
<td>UP509</td>
</tr>
<tr>
<td>NIBCO</td>
<td>S-413-Y-LF</td>
<td>T-413-Y-LF</td>
</tr>
</tbody>
</table>

I. Lead Free Lift Check Valves – 2 inch and smaller, Class 150:
3.04 APPLICATION SCHEDULE

A. General Application: Use gate, ball, and butterfly valves for shutoff duty; globe, ball, and butterfly for throttling duty. Refer to piping system Specification Sections for specific valve applications and arrangements.

B. Domestic Water Systems: Use the following valve types:

1. Gate Valves: Class 125, NSF 61 Annex G lead free cast bronze or cast-iron body to suit piping system.

2. Ball Valves, 2” And Smaller: Class 150, 600-psi CWP, with stem extension, NSF 61 Annex G lead free cast bronze.

3. Ball Valves, 2-1/2” and larger: 200-psi CWP cast iron body.

4. Globe Valves: Class 125, NSF 61 Annex G lead free cast bronze or cast-iron body to suit piping system, and bronze or teflon disc.

5. Butterfly Valves: [Aluminum-bronze][CF8M (316) stainless steel] disc; EPDM or Buna N sleeve and stem seals.

6. Bronze Swing Check: Class 125, NSF 61 Annex G lead free cast bronze, with rubber seat.

7. Check Valves: Class 125, swing or wafer type as indicated.

3.05 VALVE INSTALLATIONS

A. Locate valves for easy access and provide separate support where necessary. Provide access doors and fire rated access doors as required.

B. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

C. Install three-valve bypass around each pressure reducing valve using throttling-type valves.

D. Install valves in horizontal piping with stem at or above the center of the pipe.

E. Install valves in a position to allow full stem movement.
F. Installation of Check Valves: Install for proper direction of flow as follows:

1. Swing Check Valves: Horizontal position with hinge pin level.

2. Lift Check Valve: With stem upright and plumb.

3.06 FIELD QUALITY CONTROL

A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.07 ADJUSTING AND CLEANING

A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.

B. Inspect valves for leaks after piping systems have been tested and put into service, but before final adjusting and balancing. Adjust or replace packing, as required, on valves with leaks. Replace valve if leak persists.

END OF SECTION
SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING

PART 1  GENERAL REQUIREMENTS

1.01  SUMMARY

A.  This Section includes the following:

1.  Horizontal-piping hangers and supports

2.  Vertical-piping clamps

3.  Hanger-rod attachments

4.  Building attachments

5.  Shields

6.  Spring hangers and supports

7.  Miscellaneous materials

8.  Pipe alignment guides

9.  Anchors

10.  Equipment supports

11.  Pre-engineered support strut systems

12.  Pre-engineered roof supports

13.  Expansion Anchors

B.  Related Sections: The following sections contain requirements that relate to this Section:

1.  Division 22 Section “Plumbing Insulation”, for high density insulation for protecting insulation vapor barrier and materials and methods for piping hanger installations.

2.  Division 22 “Water Distribution Piping and Specialties”, for pipe hanger types and spacing for horizontal and vertical domestic water distribution and heat traced piping of sizes and materials indicated.

3.  Division 22 “Sanitary Drainage & Vent Piping and Specialties”, for pipe hanger types and spacing for heat traced and cold sanitary piping of sizes and materials indicated.
4. Division 22 “Storm Drainage & Piping and Specialties”, for pipe hanger types and spacing for horizontal and vertical storm drainage piping of sizes and materials indicated.

1.02 DEFINITIONS
A. Terminology used in this Section is defined in MSS SP-90.

1.03 SUBMITTALS
A. General: Submit the following in accordance with conditions of contract and Division 1 specification Sections.

1. Product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing Manufacturer's figure number, size, location, and features for each required pipe hanger and support.

2. Product certificates signed by the manufacturer of hangers and supports certifying that their products meet the specified requirements.

3. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" Article.

4. Assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.

5. Maintenance data for supports and anchors for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."

1.04 QUALITY ASSURANCE
A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Qualify welding processes and welding operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

C. Regulatory Requirements: Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.
D. Nationally Recognized Testing Laboratory and NEMA Compliance (NRTL): Hangers, supports, and components shall be listed and labeled by a NRTL where used for fire protection piping systems. The term "NRTL" shall be as defined in OSHA Regulation 1910.7.

**PART 2   PRODUCTS AND MATERIALS**

2.01 MANUFACTURERS

A. Hangers and Supports
   1. Anvil International
   2. B-Line
   3. Halfen-DEHA
   4. Hilti
   5. ERICO\Michigan Hanger Co.
   6. Midwest
   7. National Pipe Hanger Corporation
   9. Truscon
   10. Unistrut

B. Expansion Anchors
   1. Hilti
   2. Phillips
   3. Power Fasteners
   4. Rawl

C. Pre-Engineered Roof Pipe Supports
   1. Airtec
   2. B-Line
   3. ERICO
   4. MIRO
5. Roof Top Blox
6. Portable Pipe Hangers

2.02 SUPPORT MATERIALS

A. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58.

   1. Components shall have galvanized coatings where installed for piping and equipment that will not have field-applied finish.

   2. Pipe attachments shall be copper-plated or have nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

B. Insulation Protection Shield: Sheet metal construction, meeting MSS SP-69 & SP-58 Type 40, of 18 gauge for 5-1/2” inside dimension and smaller, 16 gauge for 6-1/2” to 10-3/4” inside dimension and 14 gauge for 11-3/4” to 17” inside dimension. Shield shall cover half of the circumference of the pipe and shall be of length indicated by manufacturer for pipe size and thickness of insulation.

C. 360° Insulation Protection Shield: Sheet metal construction, of 18 gauge for 5-1/2” inside dimension and smaller, 16 gauge for 6-1/2” to 10-3/4” inside dimension and 14 gauge for 11-3/4” to 17” inside dimension. Shield shall cover all of the circumference of the pipe with two half circumference sections held together with bolts and nuts and shall be of length indicated by manufacturer for pipe size and thickness of insulation.

D. Pre-engineered Support Strut Systems: Minimum 14 gauge galvanized steel with factory-punched attachment holes. Two piece straps shall be captivated at the shoulder when attachment nut is tightened and designed for use with strut system. Long or short pipe rollers designed for use with strut system, where indicated, shall attach to the channel with brackets and nuts. Provide plastic galvanic isolators for connecting bare copper pipe for use with pre-engineered support strut system where indicated. All nuts, brackets and clamps shall have the same finish as the channels.

E. Expansion Anchors: Self drilling, drilled flush or shell type.

F. Pre-Engineered Roof Pipe Supports: 4” X 4” X 12” long closed cell polyethylene blocks with embedded pre-engineered support strut or pre-engineered support struts with factory plastic bases. Two piece straps shall be captivated at the shoulder when attachment nut is tightened and designed for use with strut system. All nuts, brackets and clamps shall have the same finish as the channels.

2.03 MISCELLANEOUS MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.
B. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix ratio shall be 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

**PART 3 EXECUTION**

**3.01 INSTALLATION OF HANGERS AND SUPPORTS**

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; do not attach to ceilings, equipment, ductwork, conduit and other non-structural elements such as floor and roof decking.

B. Hangers, supports, clamps and attachments shall comply with MSS SP-69 and SP-89. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe as specified above for individual pipe hangers.

C. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Where concrete with compressive strength less than 2,500 psi is indicated, install reinforcing bars through openings at top of inserts.

D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Provide two nuts on threaded supports to securely fasten the support.

E. Field-Fabricated, Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS D-1.1.

F. Support fire protection systems piping independently from other piping systems.

G. Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

H. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ASME B31.9 Building Services Piping Code is not exceeded.

J. Insulated Piping: Comply with the following installation requirements.

1. Riser Clamps: Attach riser clamps, including spacers (if any), to piping with riser clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9. Do not use riser clamps to support horizontal, insulated piping. Seal insulation for hot piping and protect vapor barrier for cold piping as specified in Division 22 Section "Plumbing Insulation".

2. Insulation Protection Shield: Install insulation protection shield and high density insulation where vapor barrier is indicated, sized for the insulation thickness used as specified in Division 22 Section “Plumbing Insulation”.
   a. Install a minimum 8” long section at each support point, top and bottom halves of the pipe, of same thickness of insulation used.

K. Pre-engineered Support Strut Systems: Channel strut systems can be used at the Contractors option in lieu of individual hangers for horizontal pipes. Space channel strut systems at the required distance for the smallest pipe supported. Provide channel gauge and hanger rods per the manufacturer’s recommendations for the piping supported. Where strut systems are attached to walls, install anchor bolts per manufacturer’s recommendations.

   1. Uninsulated Copper Pipe: Install with plastic galvanic isolators
   2. Insulated Tube or Pipe: Install with 360° insulation protection shields or pre-engineered thermal hanger-shield inserts as specified in Division 22 Section “Plumbing Insulation”.

L. Expansion Anchors: Use in existing concrete, masonry or in pre-cast concrete construction.

M. Pre-Engineered Roof Pipe Supports: Set supports on an 18” X 18” x 3/16” thick roof walkway material compatible with the roof material.

3.02 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and with AWS Standards D1.1.
C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to control movement to compensators.

D. Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe runs, at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.03 EQUIPMENT SUPPORTS
A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
B. Grouting: Place grout under supports for piping and equipment.

3.04 METAL FABRICATION
A. Cut, drill, and fit miscellaneous metal fabrications for pipe anchors and equipment supports. Install and align fabricated anchors in indicated locations.
B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
C. Field Welding: Comply with AWS D1.1 for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours welded surfaces to match adjacent contours.

3.05 ADJUSTING
A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
B. Touch-Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces.
1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

C. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting".

END OF SECTION
SECTION 22 05 33
HEAT TRACING FOR PLUMBING PIPING

PART 1  GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section includes pipe freeze protection system, grease waste temperature maintenance system, and installation instructions.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 22 Section “Plumbing Insulation” for piping insulation and installation requirements.

2. Division 23 Section “Direct-Digital Control for HVAC” for interlock of alarms with facility management system and alarm wiring.

3. Division 26 Section “Common Work Results for Electrical” required electrical devices.

4. Division 26 Sections "Enclosed Switches and Circuit Breakers" for field-installed disconnects.

1.02 SUBMITTALS

A. Refer to Division 1 and Division 22 Section “General Plumbing Requirements” for administrative and procedural requirements for submittals.

B. Product Data: Submit product data on the following items:

1. Pipe Freeze Protection System

1.03 QUALITY ASSURANCE

A. Pipe freeze protection system shall be listed and classified by Underwriter's Laboratories, Inc. as suitable for purpose intended.

PART 2  PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

A. Manufacturer: System components shall be factory tested with manufacturers’ standard tests to ensure that all devices, components, and systems are in proper working order before shipment. Subject to
compliance with requirements, provide piping materials and specialties from one of the following:

1. Pipe Freeze Protection System
   a. Chromalox
   b. Nextron
   c. Nelson
   d. Tyco Thermal Controls/Raychem

2.02 PIPE FREEZE PROTECTION SYSTEM

A. In general the system shall include the following items:
   1. Heating cable control panel.
   2. Transformer(s).
   4. Parallel circuit heating cable.
   5. Branch circuit wiring and conduit.
   6. Other items necessary for a complete system.

B. Heating Cable and Accessories:
   1. Parallel circuit, jacketed cable, self-limiting, designed to operate on voltage as specified on the drawings. Cable shall consist of two nickel-copper bus wires embedded in parallel in a self regulating polymer core. Cable shall be capable of varying its output along its length. Provide wattage as required for piping and insulation involved per manufacturer’s recommendations.
   2. Heating cable shall be covered by a polyolefin dielectric jacket.
   3. Heating cable shall be grounded with a braid of tinned copper.
   4. Where indicated on the drawings, heating cable shall have polyolefin outer jacket for protection against aqueous inorganic chemicals. Where indicated on the drawings, heating cable shall have fluoropolymer outer jacket for protection against organic chemicals or corrosives.
   5. Termination fittings for direct connection to junction boxes.
   6. Junction Boxes: Junction boxes shall be NEMA 4X Watertight, even where located indoors.
C. Control Panel:

1. NEMA 4X Fiberglass Reinforced Plastic enclosure for outdoor installation with hinged access door with window and furnished with the following:

2. Microprocessor based controller with LED display with keypad interface and non-volatile memory.

3. Ground fault circuit protection capable of checking heating cable circuit faults

4. LED Indicator Lights: Current mode, heater on, alarm conditions and receive / transmit data.

5. Alarm Conditions: RTD failure, high/low temperature, high/low current, hi/low resistance and high/low voltage, ground fault alarm, trip, loss of programmed values and electromechanical relay failure.

6. Alarm Contacts: One single pole single throw rated at 0.75 amp 120 to 277 volt relay and one dry pilot duty only relay rated at 48 VAC / DC 50 milliamps, 10VA maximum resistive switching

7. Power strip for connecting 277 volt single phase at 30 amps maximum.

8. Temperature Control Sensors: Total of two three wire 100 Ohm RTD’s with 10 foot long stainless steel sheath, ambient temperature range of \(-76\)°F to \(1058\)°F with an accuracy of \(\pm 3\)°F and a repeatability of \(\pm 3\)°F.

D. Temperature Control Sensor

1. Provide outdoor ambient thermostat with adjustable contacts set to close on decreasing temperature.

2. Provide pipe mounted sensor with adjustable setpoint set to close on decreasing temperature.

**PART 3 EXECUTION**

3.01 PIPE FREEZE PROTECTION SYSTEM INSTALLATION

A. Furnish and install a pipe freeze protection system to prevent the following piping from freezing where located in unheated areas:

1. Domestic water piping.

2. Sanitary P-traps.

3. Horizontal and vertical sanitary piping
B. Installation:
   1. Cut cable to length as required to suit pipe lengths and watt per foot requirements.
   2. Install and test heating cable after pipe is pressure tested and before pipe is insulated.
   3. Secure cable to pipe with cable ties or belts and install according to manufacturer’s instructions.
   4. Install cable on piping in accordance with manufacturer’s recommendations for a minimum ambient temperature of minus 20 degrees F.
   5. Install junction boxes where necessary.
   6. Install control panels at the locations indicated.

C. Connections:
   1. Electrical wiring and connections are specified in Division 26 Section “Common Work Results for Electrical”.
   2. Coordinate interlock of heat trace system control panel alarm conditions with the facility management system. Alarm wiring and alarm interlock with the facility management system are specified in Division 23 Section “Direct-Digital Control for HVAC”.

D. Insulation:
   1. Install and test electric heat trace prior to installation of insulation. Insulation is specified in Division 22 section “Plumbing Insulation”.

E. Factory Tests:
   1. Conduct manufacturers’ standard tests on all system components to assure that all devices, components, and systems are in proper working order before shipment.

F. Field Tests:
   1. Before and after installation of the thermal insulation, test heating cable with megohm meter between the heating cable bus wires and metallic braid. Minimum insulation resistance shall be 20 megohms regardless of length.
   2. Submit test report of megohmeter readings to the Owner.

END OF SECTION
PART 1  GENERAL REQUIREMENTS

1.01  SUMMARY

A. Extent of Plumbing work to be identified as required by this Section is indicated on drawings and/or specified in other Division 22 Sections.

B. Types of identification devices specified in this Section include the following:
   1. Plastic Pipe Markers
   2. Plastic Tape
   3. Underground-Type Plastic Line Marker
   4. Valve Tags
   5. Valve Schedule Frames
   6. Engraved Plastic-Laminate Signs
   7. Plastic Equipment Markers
   8. Plasticized Tags

1.02  CODES AND STANDARDS:

A. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.03  SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

C. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals as specified in Division 1.
D. Maintenance Data: Include product data and schedules in Maintenance Manuals as specified in Division 1 and Section “General Plumbing Requirements.”

1.04 SPARE PARTS

A. Furnish minimum of 5% extra stock of each plumbing identification material required, including additional numbered valve tags (not less than 3) for each piping system, additional piping system identification markers, and additional plastic laminate engraving blanks of assorted sizes.

1. Where stenciled markers are provided, clean and retain stencils after completion of stenciling and include used stencils in extra stock, along with required stock of stenciling paints and applicators.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide plumbing identification materials of one of the following:

1. Allen Systems, Inc.
3. Industrial Safety Supply Co., Inc.
4. Seton Name Plate Corp.

2.02 PLUMBING IDENTIFICATION MATERIALS

A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 22 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.03 PLASTIC PIPE MARKERS

A. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1

B. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1

C. Small Pipes: For external diameters less than 6” (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.

2. Adhesive lap joint in pipe marker overlap.

3. Laminated or bonded application of pipe marker to pipe (or insulation).

4. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".

D. Large Pipes: For external diameters of 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:

1. Laminated or bonded application of pipe marker to pipe (or insulation).

2. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2" wide; full circle at both ends of pipe marker, tape lapped 3".

3. Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless steel bands.

E. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as a separate unit of plastic.

F. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with names as shown or specified.

2.04 PLASTIC TAPE

A. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.

B. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.

C. Color: Comply with ANSI A13.1, except where another color selection is indicated.

2.05 UNDERGROUND-TYPE PLASTIC LINE MARKER

A. General: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates the type of service of buried pipe.
1. Provide multi-ply tape consisting of solid aluminum foil core between 2-layers of plastic tape.

2.06 VALVE TAGS

A. Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32" thick engraved plastic laminate valve tags, with piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.

1. Provide 1-1/2" sq. black tags with white lettering, except as otherwise indicated.

B. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

C. Access Panel Markers: Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.

2.07 VALVE SCHEDULE FRAMES

A. General: For each page of valve schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

2.08 ENGRAVED PLASTIC-LAMINATE SIGNS

A. General: Provide engraving stock melamine plastic laminate, complying with ASTM D 709, in the sizes and thickness indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for plumbing fastening except where adhesive mounting is necessary because of substrate.

B. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.

C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.09 PLASTIC EQUIPMENT MARKERS

A. General: Provide manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code:

1. Green: Cooling equipment and components.
2. **Yellow**: Heating equipment and components.

3. **Yellow/Green**: Combination cooling and heating equipment and components.

4. **Brown**: Energy reclamation equipment and components.

5. **Blue**: Equipment and components that do not meet any of the above criteria.

6. For hazardous equipment, provide colors and designs recommended by ANSI A13.1.

**B. Nomenclature**: Include the following, matching terminology on schedules as closely as possible:

1. Name and plan number.

2. Equipment service.

3. Design capacity.

4. Other design parameters such as pressure drop, entering and leaving conditions, rpm, etc.

**C. Size**: Provide 2-1/2" x 4" markers for control devices, dampers, and valves; and 4-1/2" x 6" for equipment.

2.10 **PLASTICIZED TAGS**

A. **General**: Manufacturer's standard pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matt finish suitable for writing. Tags shall be minimum 3-1/4" x 5-5/8" in size, provided with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples; DANGER, CAUTION, DO NOT OPERATE).

2.11 **LETTERING AND GRAPHICS**

A. **General**: Coordinate names, abbreviations and other designations used in plumbing identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of plumbing systems and equipment.

1. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples; Boiler No. 3, Air Supply No. 1H, Standpipe F12).
PART 3  EXECUTION

3.01  GENERAL INSTALLATION REQUIREMENTS

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished plumbing spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02  PIPING SYSTEM IDENTIFICATION

A. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

1. Plastic pipe markers, with application system as indicated under "Materials" in this section. Install on pipe insulation segment where required for hot non-insulated pipes.

B. Application: Provide piping system identification for the following systems:

1. Domestic cold water piping.
2. Domestic hot water piping.
3. Domestic hot water recirculating piping.
4. Sanitary and waste piping.
5. Storm water piping.
6. Vent piping.
7. Insulated and non-insulated storm water piping.
8. Compressed air piping.

C. Location: Install pipe markers and color bands in the following locations where piping is exposed to view, concealed only by a removable ceiling system, installed in machine rooms, installed in accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

1. Within 5 feet of each valve and control device.
2. Within 5 feet of each branch, excluding take-offs less than 25 feet in length for fixtures; mark flow direction of each pipe at branch connection.
3. Within 5 feet where pipes pass through walls, floors or ceilings or enter non-accessible enclosures. Provide identification on each side of wall, floor or ceiling.

4. At access doors, manholes and similar access points which permit view of concealed piping.

5. Within 5 feet of major equipment items and other points of origination and termination.

6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment where there are more than two piping systems or pieces of equipment.

3.03 UNDERGROUND PIPING IDENTIFICATION

A. General: During back-filling/top-soiling of each exterior underground piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16", install single line marker. For tile fields and similar installations, mark only edge pipe lines of field.

3.04 VALVE IDENTIFICATION

A. General: Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibbs, and shut-off valves at plumbing fixtures and similar rough-in connections of end-use fixtures and units.

B. List each tagged valve in valve schedule for each piping system. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.

1. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

3.05 PLUMBING EQUIPMENT IDENTIFICATION

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of plumbing equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:

1. Meters, gauges, thermometers and similar units.
2. Pumps

3. Water heaters, tanks and pressure vessels.

4. Strainers, water treatment systems and similar equipment.

B. Optional Sign Types: Where lettering larger than 1" height is needed for proper identification, because of distance from normal location of required identification, stenciled signs may be provided in lieu of engraved plastic, at Installer's option.

C. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2'-0", 1/2" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.

D. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

1. Optional Use of Plasticized Tags: At Installer's option, where equipment to be identified is concealed above acoustical ceilings or similar concealment, plasticized tags may be installed within concealed space to reduce amount of text in exposed sign (outside concealment).

END OF SECTION
SECTION 22 07 00
PLUMBING INSULATION

PART 1 GENERAL REQUIREMENTS

1.01 SUMMARY
A. Extent of Plumbing insulation required by this Section is indicated on drawings and schedules, and by requirements of this Section.
B. Types of Plumbing insulation specified in this Section include the following:
   1. Piping Systems Insulation:
      a. Fiberglass
      b. Flexible Elastomeric
   2. Equipment Insulation:
      a. Fiberglass
      b. Flexible Elastomeric

1.02 QUALITY ASSURANCE
A. Flame/Smoke Ratings: Provide composite Plumbing insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
   1. Exception: Outdoor Plumbing insulation may have flame spread index of 75 and smoke developed index of 150.
   2. Exception: Industrial Plumbing insulation that will not affect life safety egress of building may have flame spread index of 75 and smoke developed index of 150.
B. Related Sections: The following sections contain requirements that relate to this Section:
   1. Division 22 Section "Hangers and Supports for Plumbing Piping," for insulation shields for protecting insulation vapor barrier and materials and methods for piping installations.

1.03 SUBMITTALS
A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of Plumbing insulation. Submit
schedule showing manufacturer’s product number, k-value, thickness, and furnished accessories for each Plumbing system requiring insulation.

B. Maintenance Data: Submit maintenance data and replacement material lists for each type of Plumbing insulation. Include this data and product data in maintenance manual.

C. Samples: Submit manufacturer’s sample of each piping insulation type required, and of each duct and equipment insulation type required. Affix label to sample completely describing product.

1.04 LEED SUBMITTALS

A. [Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1, Section 7 - "Service Water Heating."]

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

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

1. Aeroflex USA, Inc.
2. Armacell LLC.
3. Cell-U-Foam Corp.
4. CertainTeed Corp.
5. Knauf Insulation
6. Johns Manville
7. K-Flex USA
8. Owens Corning
9. Pittsburgh Corning Corp.
10. ITW Insulation Systems, Inc.
11. Dyplast Products.

2.02 PIPING INSULATION MATERIALS

A. Fiberglass Piping Insulation: ASTM C 547, Class 1 unless otherwise indicated.
B. Flexible Elastomeric Piping Insulation: ASTM C 534, Type I.

C. Jackets for Piping Insulation: ASTM C 1136, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installers option.

1. Encase pipe fittings insulation with one-piece pre-molded PVC fitting covers, fastened as per manufacturer's recommendations. PVC fitting covers shall be Johns Manville Zeston 2000 PVC or approved equal.

D. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

E. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

F. Adhesives for LEED Projects:

1. [Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.]
   a. [For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).]

2. [Joint Sealants:]
   a. [For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).]

G. Insulation Diameters: Comply with ASTM C585 for inner and outer diameters of rigid thermal insulation.

H. Pipe, Valve and Fitting Covers: Comply with ASTM C450 for fabrication of fitting covers for pipe, valves and fittings.

I. High Density Insulation Billets:


J. Pre-Engineered Thermal Hanger-Shield Inserts:

1. Calcium silicate insulation meeting ASTM C 795 and encased in steel insulation shield.

2. Flexible elastomeric piping insulation meeting ASTM C 534-01a, Type I with integral high density pipe supports and encased in steel insulation shield.
   a. Manufacturer: Cooper B-Line / Armacell or approved equal
2.03 EQUIPMENT INSULATION MATERIALS


B. Flexible Fiberglass Equipment Insulation: ASTM C 553, Type I, Class B-4.

C. Flexible Elastomeric Equipment Insulation: ASTM C 534, TYPE II.

D. Jacketing Material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.

E. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

F. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

PART 3 EXECUTION

3.01 PLUMBING PIPING SYSTEM INSULATION

A. Insulation Omitted: Omit insulation on the following:
   1. Chrome-plated exposed piping
   2. Water Hammer Arrestors
   3. Balancing and flow valves
   4. Drain lines from water coolers
   5. Drainage piping located in crawl spaces or tunnels
   6. Exterior condensate drain piping
   7. Buried piping
   8. Pre-insulated equipment.

B. Cold Piping:
   1. Application Requirements: Insulate the following cold plumbing piping systems:
      a. Potable cold water piping.
      b. Non-potable cold water piping
c. Potable chilled water piping.

d. Plumbing vents within 6 lineal feet of roof outlet.

e. Horizontal and vertical interior above-ground storm drainage piping and vertical run from roof drain to horizontal run.

f. Horizontal and vertical interior above-ground overflow storm drainage piping and vertical run from roof drain to horizontal run. Where vertical overflow storm drainage piping from the outlet exceeds 15 feet, only insulate within 15 feet of the outlet.

g. Lawn irrigation piping.

h. Condensate piping inside the building.

2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

   a. Fiberglass: 1" thickness.

C. Hot Piping:

1. Application Requirements: Insulate the following hot plumbing piping systems:

   a. Potable hot water piping.

   b. Potable hot water recirculation piping.

   c. Hot drain piping (where indicated).

2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

   a. Fiberglass: 1" thick for pipe sizes up to and including 6", 1-1/2" thick for pipe sizes over 6".

3. Insulate hot water piping systems up to 140F specified above with one of the following types and thicknesses of insulation:

   a. Fiberglass: 1" thick for pipe sizes up to and including 1-1/2", 1-1/2" thick for pipe sizes 2" and larger.

4. Insulate hot water piping systems greater than 140F specified above with one of the following types and thicknesses of insulation:

   a. Fiberglass: 1-1/2" thick for pipe sizes up to and including 1-1/2", 2" thick for pipe sizes 2" and larger.
D. P-traps:

1. Insulate P-traps receiving chilled water waste and P-traps of water coolers as described below:
   a. Flexible Elastomeric: 1/2" thick for pipe sizes up to and including 2", 1" thick for pipe sizes 2" to 6" (largest size permitted).

2. Insulate P-traps receiving hot water waste above 140F as described below:
   a. Fiberglass: 1" thickness.
   b. Flexible Elastomeric (high temp formula up to 300F): 1" thickness.

E. Piping Inside Masonry Wall Units:

1. Insulate cold, hot and hot water recirculation piping installed inside of masonry walls where the piping needs to be insulated as the wall is constructed as described below:
   a. Flexible Elastomeric: 1/2" thick for pipe sizes up to and including 2", 1" thick for pipe sizes 2" to 6" (largest size permitted).

3.02 EQUIPMENT INSULATION

A. Cold Equipment (Below Ambient Temperature):

1. Application Requirements: Insulate the following cold equipment:
   a. Drip pans under chilled equipment.

2. Water softeners.
   a. Roof drain bodies.

3. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:
   a. Fiberglass: 2" thick for cold surfaces above 35 degrees F (2 degrees C) and 3" thick for surfaces 35 degrees F (2 degrees C) and lower.
   b. Flexible Elastomeric: 1" thick.

B. Hot Equipment (Above Ambient Temperature):

1. Application Requirements: Insulate the following hot equipment:
2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:
   
   a. Fiberglass: 2" thick, except 3" thick for low-pressure boilers and steam-jacketed heat exchangers.

3.03 INSTALLATION OF PIPING INSULATION

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.

C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with a single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure a complete and tight fit over surfaces to be covered.

E. Maintain integrity of vapor-barrier jackets on cold pipe insulation, and protect insulation with shields to prevent puncture or other damage as specified in Division 22 Section “Hangers and Supports for Plumbing Piping.” Provide high density insulation billets of material as specified herein and of length equivalent to pipe shield. Provide pipe hangers sized for the pipe outside diameter plus insulation thickness. Seal butt joint between insulation and high density insulation with wet coat of vapor barrier lap cement.

1. Exception for vertical piping: Provide clamps sized for the outside diameter of the vertical pipe and extend clamp through insulation. Seal penetrations of insulation and vapor barrier with wet coat of vapor barrier lap cement.

F. Provide pipe hangers for hot piping sized for the outside diameter of piping. Butt insulation to hanger or riser clamp for vertical pipe. Seal exposed insulation with insulation sealer.

G. Butt pipe insulation tightly at insulation joints. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

H. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves (except balancing and flow control valves), strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. 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, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. 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 (except balancing and flow control valves), flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
I. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

J. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

K. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

L. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

3.04 INSTALLATION OF EQUIPMENT INSULATION

A. General: Install equipment thermal insulation products in accordance with manufacturer’s written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.
C. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.

D. Do not apply insulation to equipment, breechings, or stacks while hot.

E. Apply insulation using the staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.

F. Coat insulated surfaces with layer of insulating cement, troweled in workmanlike manner, leaving a smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.

G. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2”. Apply over vapor barrier where applicable.

H. Do not insulate boiler manholes, handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.

I. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames and accessories.

3.05 PROTECTION AND REPLACEMENT

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION
SECTION 220800

COMMISSIONING PLUMBING SYSTEMS

PART 1  GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section. These requirements shall be in addition to applicable Division 01, 23 and 26 Sections.

1. Division 01 Section “General Commissioning Requirements” for general commissioning activities and requirements.

2. Division 23 Section “Commissioning of HVACR Systems” for commissioning process activities for HVACR equipment, sub-systems, and systems.

3. Division 26 Section “Commissioning of Electrical Systems” for commissioning process activities for electrical equipment, sub-systems, and systems.

1.02 SUMMARY

A. This section defines commissioning process requirements for plumbing equipment systems and sub-systems. Other testing as required under other Division 22 sections still apply.

B. Commissioning is the process of ensuring that building systems operate as intended through their life-cycle as defined in the Owner’s Project Requirements, Basis of Design and illustrated by the Contract Documents.

C. Commissioning during the construction phase is intended to achieve the following objectives according to the Contract Documents:

1. Verify that applicable systems and equipment are installed according to the manufacturer’s recommendations and to industry accepted minimum standards.

2. Verify that applicable systems and equipment received adequate operational checkout by installing contractors.

3. Verify and document proper performance of equipment and systems.

4. Verify that O&M documentation provided to the Owner is complete.
5. Verify that the Owner’s operating personnel are adequately trained.

D. General commissioning requirements and coordination are detailed in Division 01. Division 22 shall execute all commissioning responsibilities assigned to them in the Contract Documents and include the cost of commissioning in the Contract Sum.

1.03 ABBREVIATIONS & DEFINITIONS

A. Refer to Division 01 Section 019113 “General Commissioning Requirements” for abbreviations and definitions.

1.04 COMMISSIONING TEAM

A. Refer to Division 01 Section 019113 “General Commissioning Requirements” for commissioning team responsibilities for this project.

1.05 COMMISSIONING DOCUMENTATION

A. The responsible Sub-Contractor(s) shall provide the following information to the CA for inclusion in the commissioning final report:

1. Copies of completed PFCs.
2. Copies of completed Plan and Documentation Requirements for Start-up and Initial Checkout (as applicable).
3. Copies of completed Commissioning Corrective Action Reports.

1.06 SUBMITTALS

A. Refer to Division 01 Section 019113 “General Commissioning Requirements” for submittal requirements.

1.07 PLUMBING EQUIPMENT AND SYSTEMS TO BE COMMISSIONED

A. The following equipment and systems shall be commissioned within the scope of this project. All general references to equipment and systems in this document refer only to the listed equipment and systems.

1. (2) Domestic Hot Water Heaters
2. (1) Instantaneous Water Heater
3. (1) Domestic Hot Water Recirculation Pump
4. (1) Expansion Tank

B. The CxA shall be responsible for PFCs of all equipment and systems listed above, unless this specification is amended in writing by the CxA prior to bid day.
C. For critical or unique equipment (water heater, circulating pump, etc), the CxA will perform pre-functional checkout of 100% of each type. For multiples of like equipment (plumbing fixture controls, etc), the CxA will perform PFCs of 100% of the total number of units.

D. The CxA will coordinate and execute FPTs for 100% of the primary commissioned systems (domestic water heating, etc). For plumbing fixture controls, the CxA will coordinate and execute testing of 100% of each type.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified elsewhere in the Contract Documents.

1. If not otherwise specified, the following minimum requirements apply. Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of ±0.1°F. Pressure sensors shall have an accuracy of ±2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

B. Include special tools and instruments (only available from equipment manufacturer, specific to a piece of equipment) required for testing equipment in the base bid price to the CA.

C. Contractors shall comply with test equipment manufacturers calibration procedures and intervals. Recalibrate test equipment immediately after equipment has been repaired resulting from being dropped or damaged. Affix calibration tags to test equipment. Furnish calibration records to the CxA upon request.

PART 3 EXECUTION

3.01 COMMISSIONING PROCESS OVERVIEW

A. The following narrative provides a brief overview of the typical commissioning tasks during the construction, acceptance, and post-occupancy phases and the general order in which they occur.

1. Construction-related submittals for all commissioned equipment are provided to the CxA during the normal submittal process.

2. The CxA develops specific equipment PFCs.
3. Early during construction the CxA conducts a kick-off meeting and presents the commissioning process for the project. Additional meetings with the commissioning team will occur throughout the project as required.

4. The CxA executes and documents the PFCs. The CxA reports on the PFC process including managing an issues report.

5. PFCs are completed before start-up and functional testing.

6. The CA and responsible Sub-Contractors shall document equipment start-up and initial checkout with assistance from manufacturer’s technicians. The CxA may request copies of the manufacturer’s or contractor’s field start-up reports.

7. The CxA develops specific FPT plans for review by the A/E, CA and responsible Sub-Contractors.

8. The CA and responsible Sub-Contractors complete installation and checkout of all building control systems.

9. The CxA coordinates and executes FPTs with the assistance of responsible Sub-contractors. The CxA reports on the testing process including all observed deficiencies.

10. Testing of other commissioned systems not requiring formal functional testing is completed.

11. The CxA verifies training as required by the Contract Documents is completed.

12. The CxA may review close-out documentation and schedule deferred testing.

13. The CxA submits a final commissioning report.

3.02 COORDINATION

A. Sub-Contractors shall provide sufficient notice to the CA regarding their completion schedule for PFCs and start-up of all equipment and systems. Sub-Contractors shall transmit completed start-up documentation to the CxA without delay.

B. The CxA will schedule functional tests through the CA and responsible Sub-Contractors only upon completion of all checklists and start-up activities related to the equipment or system.

C. Individual Sub-Contractor’s shall be responsible for notifying the CA if commissioning activities involving a CxA site visit require rescheduling due to insufficient system completion. A Sub-Contractor’s failure to notify the CA or the CA’s failure to notify the CxA five (5) business days in
advance of a scheduled CxA site visit shall result in the CxA back-charging the CA for all reasonable travel expenses and lost time.

1. At the direction of the CxA, the CA and responsible Sub-Contractors shall participate in a meeting prior to functional testing. The meeting shall be used to verify that all commissioned systems are properly installed, functional and are ready for functional testing. Any known problems that may impact or prevent functional testing shall be discussed during the meeting. Based on the outcome of the meeting a date to commence functional testing will be determined.

3.03 PRE-FUNCTIONAL CHECKOUT AND START-UP

A. Scope

1. The following procedures apply to all equipment to be commissioned for this division.

B. Purpose

1. The purpose of the PFCs is to ensure that the commissioned equipment is properly installed and ready for start-up and initial operation. Each piece of commissioned equipment shall receive complete PFCs by the CxA. The PFCs for a given piece of equipment must be successfully completed and approved prior to start-up and functional testing.

2. The primary role of the CxA is to ensure that there is written documentation and that each of the equipment manufacturer’s recommended start-up procedures have been completed. The Sub-Contractor responsible for scheduling start-up shall ensure legible start-up documentation is submitted to the CxA through the CA.

C. Execution

1. The CxA shall complete the PFCs concurrently with construction.

D. Documentation, Deficiencies and Approval of Tests

1. The Sub-Contractors shall clearly document any outstanding items from the PFCs and initial startup that were not completed successfully. The completed documentation shall be submitted, through the CA, to the CxA within five (5) business days of test completion.

2. The CxA will review the startup reports for completeness. The CxA will work with the Sub-Contractors to correct deficiencies or incomplete items involving the CA and others as necessary. The Sub-Contractors shall correct deficiencies or incomplete items in a
timely manner, notifying the CA and CxA as soon as the outstanding items have been corrected. The Sub-Contractors shall submit corrected start-up reports.

3.04 TESTING PREPARATION

A. Certify in writing to the CxA that plumbing equipment and systems have passed PFCs, start-up, and controls checkout.
   1. The equipment has passed start-up in accordance with the manufacturer’s recommendations and the start-up has been documented. All start-up reports shall be submitted to the CxA.
   2. The plumbing control systems have been completed and calibrated, and are operating according to the Contract Documents, and the pretest setpoints have been recorded.

B. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

C. Verify the position of each device and interlocks identified on checklists.

D. Check safety kill switch, alarms, and interlocks (as applicable) during each mode of operation.

E. Install measuring instruments and logging devices to record test data as directed by the CxA.

3.05 FUNCTIONAL PERFORMANCE TESTING

A. Scope
   1. The following procedures apply to all commissioning FPTs for this division.

B. Purpose
   1. The objective of the FPT is to demonstrate that each commissioned system is operating according to the documented design intent and Contract Documents.

C. Execution
   1. Each commissioned system shall be tested through its approved sequence of operation including all specified modes of operation.
   2. Before test procedures are written, the CxA will be provided all requested documentation including the most currently approved controls submittals and any device parameters that could impact
testing. The CxA will develop specific test procedures and forms to verify and document proper system operation. The CA shall authorize the required Sub-Contractors and equipment manufacturers to provide assistance in developing the test procedures if requested by the CxA.

3. The CxA will submit the test procedures to the Sub-Contractors and equipment manufacturers for review for feasibility, safety, equipment and warranty protection. The CxA will also submit the test procedures to the A/E for confirmation that the functionality matches the design intent. All review comments shall be submitted to the CxA and if necessary the CxA will revise the test procedures per the submitted review comments prior to scheduling functional testing.

   a. The time required for the CxA to coordinate and execute any retesting due to a Sub-Contractor's failure to disclose during this review that test procedures are not feasible within the context of the control system installed, shall be back-charged on an hourly basis to the CA. Any required retesting shall not be considered justification for a claim of delay or request for time extension by the CA.

4. All training documentation, test reports, O&Ms, and submittals shall be at the jobsite before functional testing commences.

5. The Sub-Contractors shall have trained technicians available to assist in the execution of the functional testing and/or coordinate with equipment manufacturers to make authorized technicians available. The CxA will coordinate and execute the testing and document the testing results.

D. Documentation, Deficiencies and Approval of Tests

1. The CxA will document the results of the functional performance tests using the specific procedural forms developed for that purpose.

2. All deficiencies shall be noted and reported to the CA by the CxA within five (5) business days of test completion. The CxA may recommend corrective actions to deficiencies found, however the burden of responsibility to clear any deficiency is with the CA and A/E.

3. Corrections of minor deficiencies identified may be made during testing at the discretion of the CxA. In such cases the deficiency and resolution shall be documented in the functional test plan.

4. As testing progresses and deficiencies are identified, the CxA will discuss the deficiencies with the responsible Sub-Contractor(s).
a. When there is no dispute regarding the deficiency and the Sub-Contractor(s) accepts responsibility to perform the approved corrective action:

1) The CxA documents the deficiency and the Sub-Contractor(s) response and the testing proceeds. At the discretion of the CxA retesting of the corrected deficiency is rescheduled and the test is repeated.

b. If there is a dispute about a deficiency, regarding whether a deficiency exists or who is responsible for corrections:

1) The CxA documents the deficiency and the Sub-Contractor(s) response and reports to the CA within five (5) business days.

2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner. The CxA documents the resolution process.

3) The appropriate party performs the approved corrective actions. The CxA reschedules the test and testing is repeated until the deficiency is cleared.

4) Any deficiencies accepted by the Owner as found, or not corrected prior to submission of the final commissioning report, shall be marked as a non-conforming item for the purpose of the final report.

c. The time required for the CxA to coordinate and execute any retesting due to a specific PFC or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, shall be back-charged on an hourly basis to the CA. Any required retesting shall not be considered justification for a claim of delay or request for time extension by the CA.

d. The CxA notes each accepted functional test on the test plan. Formal approval of the completed FPTs is contingent on the final review by the CxA and the A/E. The CxA recommends acceptance of each completed test to the Commissioning Team.
3.06 PLUMBING SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Manufacturer's or independent testing requirements are specified in individual Division 22 sections. Provide test reports and certifications to the CxA.

B. Test requirements for plumbing systems cleaning, flushing, hydrostatic tests, and sterilization are specified in Division 22 piping sections. Plumbing Sub-Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, and testing plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker, markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and sterilization treatment plan.

2. Description of equipment for flushing operations.


4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and sterilized.

3.07 DEFERRED TESTING

A. If any PFC or FPT cannot be completed due to an unforeseen condition not within control of the CA, execution of the PFC or FPT shall be deferred based on the recommendation of the CxA and approval of the Owner. The affected testing shall be completed as soon as practical.

3.08 TRAINING OF OWNER PERSONNEL

A. The CA shall be responsible for training coordination, scheduling and for ensuring training is completed in accordance to the Contract Documents.

B. The CxA will verify that the training required by the Contract Documents was completed. Actual training shall be the responsibility of the Sub-Contractors and/or equipment manufacturers authorized representatives.

3.09 SYSTEMS MANUAL

A. The CxA coordinates the development of a Systems Manual with the CA. The Systems Manual expands the more traditional operating and maintenance documentation to include information gathered during the
commissioning process. The Systems Manual also serves as a training tool to inform those not involved in the design and construction phases of the project. The Systems Manual does not replace the operation and maintenance documentation required by the Contract Documents.

B. The CA shall provide the following information to the CxA:

1. As-built control schematics of each commissioned system.

2. As-built control sequences including final setpoints and including lists of all control points.

3. Final parameters of all peripheral equipment.

4. Recommended operating procedures for each piece of primary equipment and instructions for building systems integration.

5. Recommended schedule of maintenance requirements and frequency, troubleshooting guidelines, and emergency procedures.

END OF SECTION
SECTION 22 11 00
WATER DISTRIBUTION PIPING AND SPECIALTIES

PART 1 GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section includes domestic cold water, hot water, and hot water recirculation piping, fittings, and specialties within the building to a point 5 feet outside the building.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 22 Section "General Plumbing Requirements," for trenching and backfilling materials and methods for underground piping installations.

2. Division 2 Section "Water Service Systems," for water service piping beginning from 5'-0" outside the building.

3. Division 7 Section "Joint Sealers," for materials and methods for sealing pipe penetrations through basement and foundation walls, and fire and smoke barriers.

4. Division 22 Section "Identification, for Plumbing Piping and Equipment" for labeling and identification of water distribution piping.

5. Division 22 Section "Common Work Results for Plumbing," for materials and methods for fire barrier penetrations, wall penetrations and equipment pads.

6. Division 22 Section "Basic Piping Material and Methods," for materials and methods for strainers, flexible connectors, unions, dielectric unions, dielectric flanges and mechanical sleeve seals.


1.02 DEFINITIONS

A. Water Distribution Pipe: A pipe within the building or on the premises that conveys water from the water service pipe or meter to the points of usage.

B. Water Service Pipe: The pipe from the water main or other source of potable water supply to the water distribution pipe of the building served.

C. Pipe sizes used in this Specification are nominal pipe size (NPS).

D. Lead Free: Refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤0.25% per Safe Drinking Water Act as amended January 4th 2011 Section 1417.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

1. Product data for each piping specialty and valve specified.

2. Welder Certificates signed by Contractor certifying that welders comply with requirements specified in Article "Quality Assurance" below.

3. Certification of Compliance with ASME and UL fabrication requirements specified in Article "Quality Assurance" below.

4. Maintenance data for each piping specialty and valve specified for inclusion in Maintenance Manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."

5. Test reports specified in Part 3 of this Section.

6. Submit certification that specialties and fittings for domestic water distribution for drinking or cooking comply with NSF 61 Annex G and / or NSF 372. The following specialties need not comply:
   a. Hose bibbs
   b. Wall, yard and roof hydrants
   c. Emergency mixing valves
   d. Trap primers

1.04 SUBMITTALS

A. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
1.05 QUALITY ASSURANCE

A. Qualify welding processes and welding operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications."

B. Regulatory Requirements: Comply with the provisions of the following codes:

1. ASME B31.9 "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.

2. ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications" for Qualifications for Welding Processes and Operators.

1.06 SPARE PARTS

A. Maintenance Stock: Furnish one valve key for each key-operated wall hydrant, hose bibb, fixture supply, or faucet installed.

PART 2 PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

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

1. Automatic Flow Control Valves:
   b. Victaulic Company
   c. Calefi

2. Hose Bibbs:
   a. Lee Brass Co.
   b. Mansfield Plumbing Products
   c. Nibco, Inc.
   d. Prier, Inc.
   e. Watts Regulator Co.
3. Wall/Yard Hydrants:
   a. Josam Co.
   c. Prier, Inc.
   d. Tyler Pipe/Wade Div.; Subs. of Tyler Corp.
   e. Woodford Mfg. Co.

4. Backflow Preventers:
   a. Cla-Val Co.
   b. Conbraco Industries, Inc.
   c. Febco
   d. Hersey Products, Inc.
   e. Watts Regulator Co.
   f. Zurn Industries Inc. Wilkins Regulator Div.

5. Relief Valves:
   b. Conbraco Industries, Inc.
   c. Watts Regulator Co.
   d. Zurn Industries, Inc. Wilkins Regulator Div.

6. Piston Type Water Hammer Arresters:
   a. Amtrol, Inc.
   b. Josam Co.
   c. Precision Plumbing Products, Inc.
   d. PROFLO
   e. Sioux Chief Manufacturing Co.
   f. Tyler Pipe/Wade Div.; Subs. of Tyler Corp.
g. Watts Regulator Co.

h. Zurn Industries, Inc. Wilkins Regulator Div.

7. Point of Use Thermostatic Mixing Valves
   a. Acorn Engineering Co.
   b. Leonard Valve Co.
   c. Powers Process Controls

8. Emergency Mixing Valves
   a. Acorn Engineering Co.
   b. Bradley
   c. Haws Corp.
   d. Lawler Manufacturing Co., Inc.
   e. Leonard Valve Co.

9. Trap Primers and Distribution Units
   a. Precision Plumbing Products, Inc.
   b. MIFAB
   c. PROFLO
   d. Sioux Chief

10. Plumbing Pipe Support Brackets
    a. Holdrite
    b. PROFLO
    c. Sioux Chief

11. Tube Suspension Clamps
    a. PROFLO
    b. Sioux Chief or approved Equivalent

12. Roof Hydrants
    a. Mapa
2.02  PIPE AND TUBE MATERIALS, GENERAL

A.  Pipe and Tube:  Refer to Part 3, Articles "Above Ground Water Distribution Pipe and Fittings" or "Below Ground Water Distribution Pipe and Fittings", for identification of systems where the materials listed below are used.

B.  Copper Tube:  ASTM B88, Type L Water Tube, drawn temper.

C.  Copper Tube:  ASTM B88, Type K Water Tube, annealed temper.

D.  Ductile-Iron Pipe:  AWWA C151 or AWWA C115 ductile-iron pipe, with AWWA C104 cement-mortar lining.

E.  Brass Pipe:  Chrome Plated Schedule 40 ASTM B43 iron pipe size (IPS.)

2.03  FITTINGS

A.  Wrought Copper Solder-Joint Fittings:  ANSI B16.22, streamlined pattern.

B.  Ductile-Iron Gasketed Fittings:  AWWA C110 or AWWA C153, 150 psi rating, with cement mortar lining and AWWA C111 rubber gaskets.

C.  Brass Fittings:  Chrome plated ANSI B16, Class 125 with threaded connections.

D.  Cast-Iron Threaded Flanges:  ANSI B16.1, Class 125, raised ground face, bolt holes spot faced.

E.  Bronze Flanges:  ANSI B16.24, Class 150, raised ground face, bolt holes spot faced.

F.  Solder Filler Metal:  ASTM B32, 95-5 Tin-Antimony.

G.  Brazing Filler Metals:  AWS A5.8, BAg Silver.

H.  Gasket Material:  Thickness, material, and type suitable for fluid to be handled and design temperatures and pressures.

2.04  GENERAL-DUTY VALVES

A.  General-duty valves (i.e., gate, globe, check, ball, and butterfly valves) are specified in Division 22 Section "General Duty Valves for Plumbing Piping." Special duty valves are specified below by their generic name; refer to Part 3, Article "Valve Applications" for specific uses and applications for each valve specified.

2.05  SPECIAL DUTY VALVES

A.  Automatic Flow Control Valves:  400 PSI WOG, flow regulator, with series 300 stainless steel body, series 300 stainless steel automatic pre-set flow balancing cartridge, union connection body, and threaded-end connections.
2.06 PIPING SPECIALTIES

A. Hose Connections: Hose connections shall have garden hose thread outlets conforming to ASME B1.20.7.

B. Hose Bibbs: Bronze body with chrome- or nickel-plated finish, with renewable composition disc, wheel handle, 1/2- or 3/4-inch solder inlet, hose outlet.

C. Recessed Nonfreeze Wall Hydrants: Cast-bronze box, with chrome-plated face, tee handle key, vacuum breaker, hinged locking cover, 3/4-inch inlet, and hose outlet. Bronze casing shall be length to suit wall thickness.

D. Nonfreeze Post Hydrants: Cast-bronze hydrant, with tee-handle key, drain hole, vacuum breaker, 3/4-inch inlet, and hose outlet. Bronze casing with cast-iron casing guard shall be length to suit depth of bury.

E. Roof Hydrants: As specified on the drawings.

F. Relief Valves: Sizes for relief valves shall be in accordance with ASME Boiler and Pressure Vessel Codes for indicated capacity of the appliance for which installed.

1. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Temperature relief valves shall be factory set at 210 deg F, and pressure relief at 150 psi.

G. Piston Type Water Hammer Arresters: Piston type, with casing of type “L” copper tube and spun copper ends, nylon piston with two EPDM “O”rings pressure lubricated with FDA approved silicone, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.

H. Point of Use Thermostatic Mixing Valves:

1. Lead free bronze or brass body meeting ASTM B584 with non-corrosive parts, tamper resistant temperature adjustment, checks, stops, other components as scheduled and meeting ASSE 1070. Valve shall be designed to fail to the cold side of the system. Maximum pressure drop shall not be exceeded for the scheduled flow rate.

I. Emergency Mixing Valves:

1. Bronze body construction meeting ASTM B584, non-corrosive parts, tamper resistant temperature adjustment, union inlets. Valve shall be designed to fail to the cold side of the system with full cold water flow. Maximum pressure drop shall not be exceeded for the scheduled flow rate.
J. Trap Primers: Brass construction, line pressure operation, capacity to prime number of traps as indicated with distribution units complying with requirements of ASSE Standard 1018.

K. Pipe Support Brackets:

1. Sheet Stud Bracket: 20 gauge copper with nominal copper tube holes of ½” on 2” centers and holes of ¾” or 1” on 4” centers.

2. Pipe Mounted Bracket: 20 gauge copper or plastic bracket with clamps for securing copper water tube and stainless steel hose clamp for securing bracket to vertical waste and vent pipe in wall.

3. Carrier Bracket: 20 gauge copper bracket with 1” hole for supporting rough-in for flush valve copper tube and bolt slot for attaching to chair carrier.

L. Tube Suspension Clamps

1. Combination plastic supports and insulators for installing copper tube in stud walls with integral bracket for securing to stud with screws.

PART 3 EXECUTION

3.01 PREPARATION FOUNDATION FOR BELOW GROUND WATER DISTRIBUTION PIPE AND FITTINGS

A. Copper Tube: Provide 6” thick sand pipe bed underneath and around sides of pipe, up to middle half of the pipe. Support pipe in trench with sand bags level and true at fittings to prevent sand, gravel or debris from interfering with the brazing process. After pressure testing is complete, install bedding at fittings and install subbase. Refer to Section “General Plumbing Requirements” for bedding and subbase materials, excavation, trenching, backfill and compaction requirements.

B. Ductile Iron Pipe: Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand bedding. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation. For piping with rock trench bottoms, provide sand pipe bed 6” underneath and around sides of pipe up to middle half of the pipe, including fittings. After pressure testing is complete, provide first layer of pea gravel backfill 6” above pipe, tamp backfill with mechanical tamper and install bedding at fittings and install subbase. Refer to Section “General Plumbing Requirements” for bedding and subbase materials, excavation, trenching, backfill and compaction requirements.
3.02 ABOVE GROUND WATER DISTRIBUTION PIPE AND FITTINGS

A. Install Type L, drawn copper tube with wrought copper fittings and solder joints for pipe sizes 8 inches and smaller, within the building.

3.03 BELOW GROUND WATER DISTRIBUTION PIPE AND FITTINGS

A. Install Type K, soft annealed copper tube and brazed joints for pipe sizes 2 inches and smaller, with minimum number of joints, inside and outside building.

B. Install cement-lined ductile-iron pipe with rubber gasketed joints, inside and outside building, for pipe 3” and larger.

3.04 PIPING INSTALLATION

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

B. Use fittings for all changes in direction and branch connections.

C. Install piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

F. Install horizontal piping as high as possible allowing for proper slope and coordination with other components. Install vertical piping tight to columns or walls. Provide space to permit insulation applications, with 1-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

G. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, and short 3/4-inch threaded nipple and cap.

I. Fire Barrier Penetrations: Where pipes pass through fire-rated walls, partitions, ceilings, and floors, maintain the fire-rated integrity. Refer to Division 22 Section “Common Work Results for Plumbing” for special sealers and materials.
J. Exterior Wall Penetrations: Seal pipe penetrations through exterior wall constructions with sleeves packing, and sealant. Refer to Division 22 Section "Basic Piping Materials and Methods" for additional information.

K. Elevated Floor Penetrations of Waterproof Membrane, Interior Penetrations of Non-Fire Rated Walls and Concrete Slab on Grade Penetrations: Provide sleeves and seal pipes that pass through waterproof floors, non-fire rated walls, partitions and ceilings or concrete slab on grade. Refer to Division 22 Section "Basic Piping Materials and Methods" for special sealers and materials.

L. Install piping with 1/32-inch-per-foot (1/4 percent) downward slope towards drain point.

1. Install piping level with no pitch.

3.05 HANGERS AND SUPPORTS

A. General: Hanger, support, insulation protection shield and anchor components and installation procedures conforming to MSS SP-58 and SP-69 are specified in Division 22 Section "Hangers and Supports for Plumbing Piping". Conform to the table below for maximum spacing of supports.

B. Pipe Attachments: Install the following:

1. Adjustable steel clevis hangers, MSS SP-69 Type 1, for individual horizontal runs.

2. Riser clamps, MSS SP-69 Type 8, for individual vertical runs. Provide copper coated riser clamps when in contact with copper tube.

3. Insulation protection shields and high density insulation at each hanger for insulated pipe as specified in Division 22 Sections “Supports and Anchors” and “Plumbing Insulation”.

4. Copper coated extension split ring pipe clamp, MSS SP-69 Type 12, for individual vertical exposed runs of copper tube 2” and smaller on walls and for securing 1-1/4” to 2” copper tube inside walls and chases for battery fixtures. Secure clamp to the copper tube.

   a. Seal each joint with insulation and split ring pipe to maintain the insulation barrier. Refer to Section “Mechanical Insulation” for requirement for maintenance of the vapor barrier and vapor barrier seal method.

5. Extension split ring pipe clamp, MSS SP-69 Type 12, for individual vertical exposed runs of stainless steel tube 2” and smaller on walls or for securing tube inside walls for connection to faucets.
6. Support copper tube in chases and walls at plumbing fixtures with plastic or copper brackets secured to structure and U-bolts sized to bare on the pipe.

7. Engineered strut support system may be provided, at the contractor's option, in lieu of individual hangers for horizontal pipes as specified in Division 22 “Hangers and Supports for Plumbing Piping”. Provide two piece straps for uninsulated pipe secured to the bare pipe and provide plastic galvanic isolators for bare copper tube. Provide two piece straps and 360° insulation protection shields sized for the insulation thickness used for the pipe for all insulated pipes.

8. Secure copper tube rough-in for individual fixtures with sheet stud brackets attached to the wall studs or pipe mounting brackets attached to the fixture waste & vent pipe at each plumbing fixture.

9. Secure 1" and smaller copper water tubing in stud walls at stud penetrations with tube suspension clamps.
   a. Cut hole through non-supporting studs with a minimum 1/8” clearance around each uninsulated copper tube or insulated copper tube.
   b. Seal each joint of insulation and tube suspension clamp to maintain the insulation barrier. Refer to Division 22 “Plumbing Insulation” for requirement for maintenance of the vapor barrier similar to insulation butted against insulation inserts and vapor barrier seal method.

10. Secure copper tubes for flush valve wall mounted water closets to the chair carrier with carrier brackets.

C. Install hangers for horizontal piping with the following maximum spacing and minimum rod sizes:

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<td>4</td>
<td>14</td>
<td>12</td>
<td>5/8 (1/2 for copper)</td>
</tr>
</tbody>
</table>
### 3.06 PIPE AND TUBE JOINT CONSTRUCTION

#### A. Soldered Joints: Comply with the procedures contained in the AWS "Soldering Manual."

#### B. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."

1. **CAUTION:** Remove stems, seats, and packing of valves and accessible internal parts of piping specialties before soldering and brazing.

2. Fill the tubing and fittings during soldering and brazing with an inert gas (nitrogen or carbon dioxide) to prevent formation of scale.

3. Heat joints to proper and uniform temperature.

#### C. Threaded Joints: Conform to ASME B1.20.1, tapered pipe threads for field-cut threads. Join pipe fittings and valves as follows:

1. Note the 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.

2. Align threads at point of assembly.

3. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

4. Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

   a. **Damaged Threads:** Do not use pipe with corroded or damaged threads. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

#### D. Flanged Joints: Align flange surfaces parallel. 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 with a torque wrench.

E. Joints Containing Dissimilar Metals: Provide dielectric unions for 2” and smaller and dielectric flanges for piping 2-1/2” and larger. Provide dielectric waterway fittings for 2” and smaller in concealed locations. Dielectric unions, waterway fittings and flanges are specified in Section “Basic Piping Materials and Methods”.

F. Joints at Valve Assemblies or Connections to Equipment: Provide unions downstream of shutoff valves at valve assemblies or equipment connections. Unions are not required at flanged connections. Unions are specified in Division 22 section “Basic Piping Materials and Methods”.

3.07 SERVICE ENTRANCE

A. Extend water distribution piping to connect to water service piping, of size and in location indicated for service entrance to building. Water service piping is specified in a separate section of Division 2.

B. Underground exterior water distribution piping to be a depth as required by local conditions, in accordance with authority having jurisdiction’s requirements and at depth no less than 18” below grade.

C. Install sleeve and mechanical sleeve seal at penetrations through foundation wall for watertight installation.

D. Install sleeve and caulk at penetrations through building floor for watertight installation.

E. Install shutoff valve at service entrance inside building; complete with strainer, pressure gauge, and test tee with valve.

F. Ductile-Iron Pipe: Install in accordance with AWWA C-600. Pipe below ground inside building and to a point 5 feet outside of building shall have restrained joints.

3.08 INSTALLATION OF WATER METER

A. Install water meter in accordance with utility company's installation instructions and requirements.

1. Provide three valve water meter by pass, sized per the authority having jurisdiction's requirements.

B. Size meter and arrange piping and specialties to comply with utility company's requirements.

C. Set meter on concrete pad as indicated. Refer to Division 3 for concrete, formwork, and reinforcing requirements.
1. Mount meter on wall brackets as indicated.

3.09 ROUGH-IN FOR WATER METER
A. Install rough-in piping and specialties for water meter installation in accordance with utility company’s instructions and requirements.

3.10 VALVE APPLICATIONS
A. General-Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:


B. Throttling duty: Use globe, ball, and butterfly valves.

3.11 INSTALLATION OF VALVES
A. Sectional Valves: Install sectional valves on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections, and elsewhere as indicated. For sectional valves 2 inches and smaller, use gate or ball valves; for sectional valves 2-1/2 inches and larger, use gate or butterfly valves.

B. Shut-off Valves: Install shut-off valves on inlet of each plumbing equipment item, on each supply to each plumbing fixture, and elsewhere as indicated. For shut-off valves 2 inches and smaller, use gate or ball valves; for shut-off valves 2-1/2 inches and larger, use gate or butterfly valves.

C. Drain Valves: Install drain valves on each plumbing equipment item, located to drain equipment completely for service or repair. Install drain valves at the base of each riser, at low points of horizontal runs, and elsewhere as required to drain distribution piping system completely. For drain valves 2 inches and smaller, use gate or ball valves; for drain valves 2-1/2 inches and larger, use gate or butterfly valves.

D. Check Valves: Install swing check valves on discharge side of each pump and elsewhere as indicated.

E. Hose Bibbs: Install on exposed piping where indicated with vacuum breaker.

F. Wall Hydrants: Install where indicated with vacuum breaker.

G. Master Mixing Valves: Install on a sheet of plywood extending 6” beyond the physical boundary of the mixing valve and firmly attach backboard to the wall. Connect hot water return piping per the manufacturer’s published recommendations. Set temperature as scheduled on the drawings.
H. Emergency Mixing Valves: Install where indicated on the plans with hot and cold water branch lines connecting to the mains without any shutoff valves. No other fixtures shall connect to the branch lines feeding the emergency mixing valve. Install ball valves with locking handles at the emergency mixing valve as indicated on the plans.

3.12 INSTALLATION OF FLOW CONTROL VALVES

A. Install flow control valves or automatic flow control valves in each hot water recirculating loop, and elsewhere as indicated. Install a shutoff valve and strainer upstream and a union, check valve and shutoff valve downstream of each flow control or automatic flow control valve.

B. Set flow control valve flow rate as follows:

1. Preliminary Procedures For Hot Water Return System Balancing:

   a. Before operating the system perform these steps:

      1) Open valves at recirculation pump and flow control valves to full open position.

      2) Remove and clean all strainers.

      3) Check recirculation pump rotation.

      4) Set water heater temperature as indicated on the drawings.

2. Procedures For Hot Water Return System Balancing

   a. Refer to the drawings for required flow rate for each flow control valve.

   b. Provide required instrumentation to obtain proper measurements. Instruments shall be properly maintained and protected against damage.

   c. Apply instrument as recommended by the manufacturer.

   d. Take readings with the eye at the level of the indicated value to prevent parallax.

   e. Mark flow control valve setting with memory stop. Mark with paint or other suitable, permanent identification materials.

   f. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

C. Reports: Prepare hot water return system balancing reports signed and submit to the Architect upon completion of the project. Include the following information:
a. Valve tag number and description of location
b. Valve body size
c. Differential pressure reading from instrument in psi
d. Actual flow rate derived from the manufacturer’s charts and tables for the valve size and measured differential pressure.

3.13 TRAP PRIMERS

A. Install trap primers where indicated and where required by local authorities having jurisdiction.

B. Connect trap primer supply line to the top of domestic cold water line no larger than 1 ½” in diameter.

C. Provide trap primer distribution units for trap primers serving more than one trap.

D. Install trap primer distribution level to insure even water distribution unit to each circuit.

E. Where applicable, adjust the trap primer for proper flow.

F. Install trap primers a minimum of 12 inches above finished floor for every 20 feet of horizontal outlet piping to floor drains served.

G. Install trap primers in an accessible location.

H. Refer to Division 22 Section “Sanitary Drainage and Vent Piping and Specialties” for trap primer outlet pipe requirements.

3.14 INSTALLATION OF PIPING SPECIALTIES

A. Install backflow preventers at each connection to mechanical equipment and systems and in compliance with the plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air gap fitting and pipe relief outlet drain without valves to nearest floor drain.

B. Install pressure reducing valves with inlet and outlet shutoff valves and balance cock bypass. Install pressure gauge on valve outlet.

3.15 EQUIPMENT CONNECTIONS

A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by plumbing code.

B. Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated. Provide shutoff valve and
union for each connection; provide drain valve on drain connection. For connections 2-1/2 inches and larger, use flanges instead of unions.

3.16 FIELD QUALITY CONTROL

A. Inspections: Inspect water distribution piping as follows:

1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.

2. During the progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.

   a. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed in after system is roughed in and prior to setting fixtures.

   b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to ensure compliance with the requirements of the plumbing code.

   c. Reinspections: Whenever the plumbing official finds that the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection by the plumbing official.

   d. Reports: Prepare inspection reports signed by the plumbing official and turn over to the Architect upon completion of the project.

B. Piping System Test: Test water distribution systems in accordance with the procedures of the authority having jurisdiction, or in the absence of a published procedure, as follows:

1. Test for leaks and defects all new water distribution piping systems and parts of existing systems that have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.

2. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.

3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure.
rating of the piping system materials. Isolate the test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.

4. Repair all leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.

5. Reports: Prepare inspection reports and required corrective action signed by the plumbing official and turn over to the Architect upon completion of the project.

3.17 ADJUSTING AND CLEANING

A. Clean and disinfect water distribution piping as follows:

1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired prior to use.

2. Use the purging and disinfecting procedure proscribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, the procedure described in either AWWA C651, or AWWA C652, or as described below:
   a. Flush the piping system with clean, potable water until dirty water does not appear at the points of outlet.
   b. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.
   c. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
   d. Following the allowed standing time, flush the system with clean, potable water until chlorine residual is lowered to incoming city water level.
   e. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

3. Reports: Prepare disinfection reports signed by the authority having jurisdiction and turn over to the Architect upon completion of the project.
3.18 COMMISSIONING

A. Fill the system. Check compression tanks to determine that they are not air bound and that the system is completely full of water.

B. Before operating the system, perform these steps:

1. Close drain valve, hydrants, and hose bibbs.
2. Open valves to full open position.
3. Remove and clean strainers.
5. Lubricate pump motors and bearings.

END OF SECTION
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SECTION 22 13 00
SECTION SANITARY DRAINAGE AND VENT PIPING AND SPECIALTIES

PART 1 GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section includes building sanitary drainage and vent piping systems, including drains and drainage specialties.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 22 Section "General Plumbing Requirements," for trenching and backfilling materials and methods for underground piping installations.

2. Division 33 Section "Sanitary Sewage Systems," for sanitary drainage piping beginning from 5'-0" outside the building.

3. Division 7 Section "Joint Sealers," for materials and methods for sealing pipe penetrations through basement and foundation walls, and fire and smoke barriers.


5. Division 22 Section "Common Work Results for Plumbing," for materials and methods for fire barrier penetrations, wall and floor penetrations and equipment pads.


1.02 DEFINITIONS

A. **Sanitary Building Drain**: That part of the lowest piping of a drainage system which receives the discharge from soil, waste and other drainage pipes inside the walls of the building and conveys it to the building sewer.

B. **Sanitary Building Sewer**: That part of the drainage system which extends from the end of the building drain and conveys its discharge to a public sewer, private sewer, individual sewage disposal system, or other point of disposal.

C. **Drainage System**: Includes all the piping within a public or private premises which conveys sewage or other liquid wastes to a point of disposal. It does not include the mains of public sewer systems or a private or public sewage treatment or disposal plant.

D. **Vent System**: A pipe or pipes installed to provide a flow of air to or from a drainage system, or to provide a circulation of air within such system to protect trap seals from siphonage and back pressure.

1.03 SUBMITTALS

A. **General**: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. **Product data for the following products**:
   1. Drainage piping
   2. Drainage piping specialties
   3. Floor drains
   4. Trench drains
   5. Interceptors

C. **Test reports specified in Part 3 of this Section**.

1.04 LEED SUBMITTALS

A. **Product Data for Credit IEQ 4.1**: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

1.05 QUALITY ASSURANCE

A. **Regulatory Requirements**: Comply with the provisions of the following codes:
   1. 2006 International Plumbing Code
PART 2  PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

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

1. Drainage Piping Specialties, including backwater valves, expansion joints, cleanouts, floor drains, cast-iron trench drains and vandal-proof vent caps:
   b. Sioux Chief Manufacturing Co. Inc.
   d. Tyler Pipe/Wade Div.; Subs. of Tyler Corp.
   e. Watts Industries, Inc.
   f. Zurn Industries, Inc.; Hydromechanics Div.

2. Non-Metallic Trench Drains:
   a. ABT, Inc., Polydrain
   b. Quazite Corp.
   d. NDS
   e. Zurn Industries, Inc.

3. Cast Iron Soil Pipe and Fittings
   a. AB & I Foundry
   b. Charlotte Pipe and Foundry Company
   c. Tyler Pipe / Soil Pipe Division

4. Shielded Transition Couplings
   a. FERNCO, “Proflex 3000 Series”

5. Underground Shielded Adapter Couplings
   a. FERNCO, “1056 Series with SR73 Shear Ring”

6. Hubless Couplings:
   a. Anaco
   b. Ideal Tridon
   c. Mission Rubber Company
   d. ProFlo “PFNH”
   e. Tyler Pipe / Soil Pipe Division

7. Plastic Gravity Sand/Oil Separators
   a. Green Turtle, Inc.
   b. Mifab Manufacturing, Inc.
   c. Striem

2.02 ABOVE GROUND DRAINAGE AND VENT PIPE AND FITTINGS

A. Cast-Iron Soil Pipe: CISPI 301 and ASTM A888, no-hub pipe and fittings and bearing the trademark of CISPI and NSF.
   2. Heavy duty couplings and compression gaskets: ASTM C1540 and meeting FM 1680.

B. PVC Pressure Pipe and Fittings: Schedule 40 pipe meeting ASTM D1785 with “solid wall” PVC meeting ASTM D1784 with cell class 12454.
      a. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Pipe: ASTM A53, Type E or S, schedule 40, Grade B, galvanized, threaded ends.

D. Shielded Transition Couplings: ASTM C1460 with neoprene adapter gasket with stainless steel Shield and hose clamps.
2.03 UNDERGROUND BUILDING DRAIN AND VENT PIPE AND FITTINGS

A. Cast-Iron Soil Pipe: ASTM A74, Service weight, hub-and-spigot soil pipe and fittings. Pipe and fittings shall have a heavy coating of coal tar varnish or asphaltum on both inside and outside surfaces and bearing the trademark of CIPSI and NSF.


B. PVC DWV Pipe and Fittings: Schedule 40 pipe meeting ASTM D1785 and ASTM D2665 with “solid wall” PVC meeting ASTM D1784 with cell class 12454-B.

1. Fittings: DWV pattern meeting ASTM D2665 with solvent cement socket joints.


C. Underground Shielded Adapter Couplings: ASTM C1173 with neoprene adapter gasket with stainless steel shield and stainless steel hose clamps.

2.04 DRAINAGE PIPING SPECIALTIES

A. Cleanout Plugs: As specified on the drawings.

   a. Floor Cleanouts: As specified on the drawings.

B. Wall Cleanouts: As specified on the drawings.

C. Floor Drains: As specified on the drawings.

2.05 TRENCH DRAINS

A. Trench drain type designations and sizes are indicated on the Drawings.

B. Non-Metallic Trench Drains: Polyester resin and quartz aggregate, precast, interlocking design, with bottom radius and 0.6 percent slope.

1. Precast Material: Load pressure of 14,500 psi, bending pressure of 2,900 psi, frost-proof, salt-proof, inert under dilute acid and alkali conditions, and less than 1.0 percent water absorption rate.

2. Grates: Cast iron or steel as indicated, for heavy-duty truck traffic, with openings designed to prevent entry of bicycle or wheelchair tires.

2.06 INTERCEPTORS

A. Interceptor type designations, flow rates, and capacities are indicated on the Drawings.
PART 3 EXECUTION

3.01 PREPARATION FOUNDATION FOR UNDERGROUND SANITARY BUILDING DRAINS

A. Pipe Beds:

1. Cast Iron Soil Pipe: Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand bedding. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation and maintain continuous pipe slope. For piping with rock trench bottoms, provide sand pipe bed 6” underneath and around sides of pipe, including fittings. After pressure testing is complete, install subbase. Refer to Section "General Plumbing Requirements" for bedding and subbase materials, excavation, trenching, backfill and compaction requirements.

3.02 PIPE APPLICATIONS - ABOVE GROUND, WITHIN BUILDING

A. Install hubless, cast-iron soil pipe and fittings for 15” and smaller soil, waste, and vent pipe.

B. Install Type DWV copper tube with cast copper alloy solder joint drainage fittings (DWV) fittings, copper sweat X screwed with solder joints, for waste connections from urinals, lavatories, sinks, water coolers, and kitchen equipment to cast iron drainage piping.

C. Install Type M copper tube with wrought copper fittings with solder joints, 1” and smaller, with ¾” minimum size and install Type DWV copper tube with cast copper alloy solder joint drainage fittings (DWV) fittings for 1-1/4” and larger for waste connections from kitchen equipment and terminate over floor receptors with air gap.

D. Install Type M copper tube with wrought copper fittings with solder joints, 1” and smaller, with ¾” minimum size and install Type DWV copper tube with cast copper alloy solder joint drainage fittings (DWV) fittings for 1-1/4” and larger for condensate connections from mechanical equipment inside the building and terminate over floor receptors with air gap. Provide galvanic isolators as specified in Division 22 “Basic Piping Materials and Methods”.

E. Install galvanized schedule 40 steel pipe and malleable iron fittings with ¾” minimum size for condensate connections from mechanical equipment outside the building and terminate over roof receptors with air gap at roof drains as indicated on the plans.

F.

G. Install ½” type L copper tube for trap primer outlet piping.
3.03 PIPE APPLICATIONS - BELOW GROUND, WITHIN BUILDING

A. Install hub-and-spigot, service weight, cast-iron, soil pipe and fittings with gasketed joints for 15 inch and smaller for soil, waste, and vent pipe.

B. Install type "K" soft copper tube with wrought copper fittings with solder joints for sump pump discharge pipe, 2" and smaller.

C. 

D. Install ½" type K soft copper tube for trap primer outlet piping.

3.04 PIPE AND TUBE JOINT CONSTRUCTION

A. Copper Tubing: Solder joints in accordance with the procedures specified in AWS "Soldering Manual."

B. Cast-Iron Soil Pipe: Make hubless joints in accordance with the Cast-Iron Soil Pipe & Fittings Handbook, Chapter IV. Install Couplings as followings:
   1. Install hubless couplings complying with CISPI 310 on soil, waste and vent piping.

C. Cast Iron to PVC Above Grade: Join cast iron to PVC with shielded transition couplings.

D. Cast Iron to PVC Below Grade: Join cast iron to PVC with underground shielded adapter couplings.

3.05 INSTALLATION

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing, slope, expansion, and other design considerations. So far as practical, install piping as indicated.

B. Use fittings for all changes in direction and all branch connections.

C. Install piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

F. Install horizontal piping as high as possible allowing for proper slope and coordination with other components. Install vertical piping tight to columns or walls. Provide space to permit insulation applications, with 1-inch
clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

G. Paint exposed copper drain lines serving kitchen equipment with a minimum of two coats of chromium-base paint.

H. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and sealer. Refer to Division 22 Section "Basic Piping Material and Methods" for special sealers and materials.

I. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings and floors, maintain the fire rated integrity. Refer to Division 22 Section "Basic Piping Material and Methods" for special sealers and materials.

J. Foundation Penetrations: Where pipes pass through foundation walls above strip footings or under strip footings, protect pipes from building load with cast iron soil pipe sleeves two pipe sizes larger than the pipe. Sleeves installed under the strip footing shall be encased in concrete.

K. Elevated Floor Penetrations of Waterproof Membrane, Interior Penetrations of Non-Fire Rated Walls and Concrete Slab on Grade Penetrations: Provide sleeves and seal pipes that pass through waterproof floors, non-fire rated walls, partitions and ceilings or concrete slab on grade. Refer to Division 22 Section "Common Work Results for Plumbing" for special sealers and materials.

L. Make changes in direction for drainage and vent piping using appropriate 45 degree wyes, combination wye and eighth bend, or long sweep, quarter, sixth, eighth, or sixteenth bends. Sanitary tees or quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical, except use long-turn pattern combination wye and eighth bends where two fixtures are installed back to back and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. Double wyes or double wye combinations shall not be used in the horizontal. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper sized standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

M. Install underground building drains to conform with the plumbing code, and in accordance with the Cast Iron Soil Pipe Institute Engineering Manual. Lay underground building drains 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 required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

N. Install drainage piping pitched down at a minimum slope of 1/4 inch per foot (2 percent) for piping 3 inch and smaller, and 1/8 inch per foot (1 percent)
for piping 4 inch and larger. Install vent piping pitched to drain back by gravity to the sanitary drainage piping system.

O. Extend building drain to connect to service piping, of size and in location indicated for service entrance to building. Sewer service piping is specified in a separate section of Division 2.

3.06 HANGERS AND SUPPORTS

A. General: Hanger, support, insulation protection shields, and anchor components and installation procedures conforming to MSS SP-58 and SP-69 are specified in Division 22 Section “Hangers and Supports for Plumbing Piping”. Conform to the table below for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable clevis hangers, MSS SP-69 Type 1, for individual horizontal runs.

2. Riser clamps, MSS SP-69 Type 8, for individual vertical runs.

3. Insulation protection shields and high density insulation at each hanger for insulated pipe as specified in Division 22 Sections “Hangers and Supports for Plumbing Piping” and “Plumbing Insulation”.

   a. Install high density insulation on insulated pipe.

C. Install hangers at the following intervals and provide rods of diameter as listed below:

<table>
<thead>
<tr>
<th>Nom. Pipe Size</th>
<th>Steel Pipe Max. Span</th>
<th>Copper Tube Max. Span</th>
<th>Min. Rod Dia. - Inches Steel or PVC</th>
<th>Min. Rod Dia. – Inches Copper or PVC</th>
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<td>In Inches PVC</td>
<td>In Feet</td>
<td>In Feet</td>
<td>Cast Iron</td>
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1. Support all sizes of service weight horizontal cast iron piping every five feet, except up to ten feet where ten foot sections are installed. Support all sizes of hubless horizontal cast iron piping every other joint, unless over four feet, then support each joint. Provide support adjacent to joint, not to exceed 18”. Provide sway brace on horizontal piping at not more than 40’ intervals to prevent horizontal movement. Provide support at each horizontal branch.

2. Support all sizes of vertical cast iron piping every ten feet.

3. Support piping within 12” of each elbow or tee.

4. Support each P-trap.

D. Support condensate piping located on the roof with 4” x 4” x 12” long ACQ rot-proof treated timber blocks. Rot-proof timber blocks are specified in Division 22 Section “Hangers and Supports for Plumbing Piping”. Conform to the table above for maximum spacing of supports.

E. Support condensate piping located on roof with pre-engineered roof supports, pre-engineered roof supports are specified in Division 22 Section “Hangers and Supports for Plumbing Piping”. Conform to the table above for maximum spacing of supports. Adjust pipe support to maintain minimum pipe slope.

1. Support all sizes of underslab hubless horizontal cast iron piping every three feet and every other joint, unless over four feet, then support each joint. Provide support adjacent to joint, not to exceed 18”. Provide support at each horizontal branch. For piping 2’-0” or more deep from bottom of slab, provide Styrofoam block minimum 4” from bottom and sides of pipe up to bottom of slab to prevent heaving of pipe. Cut interior of Styrofoam to fit hangers and fittings. Wrap Styrofoam all around with 7 mil thick plastic sheathing by Visqueen.

3.07 INSTALLATION OF PIPING SPECIALTIES

A. Install backwater valves in sanitary building drain piping as indicated, and as required by the plumbing code. For interior installation, provide cleanout cover flush to floor centered over backwater valve cover and of adequate size to remove valve cover for service.

B. Above Ground Cleanouts: Install in above ground piping and building drain piping as indicated, and:

1. as required by plumbing code;

2. at each change in direction of piping greater than 45 degrees;
3. at minimum intervals of 50’ for piping 4” and smaller and 100’ for larger piping;

4. at base of each vertical soil and waste stack.

C. Cleanout Covers: Install floor and wall cleanout covers for concealed piping, types as indicated.

D. Floor Cleanouts: Install in below floor building drain piping at minimum intervals of 50’ for piping 4” and smaller and 75’ for larger piping.

E. Exterior Cleanouts: Install exterior cleanouts embedded in a 18” x 18” x 8” block of concrete, flush with finished grade.

3.08 INSTALLATION OF FLOOR DRAINS, FLOOR SINKS AND FLOOR TROUGHS

A. Install floor drains, floor sinks and floor troughs in accordance with manufacturer's written instructions and in locations indicated.

B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor. Set floor sinks and floor troughs flush with the level finish floor.

C. Refer to architectural documents for floor slope requirements and set floor drain elevation to match. Where architectural documents do not indicate the requirements, set the floor drain elevation depressed below the finished slab elevation as listed below to provide proper slope to drain:

<table>
<thead>
<tr>
<th>DEPRESSION IN INCHES</th>
<th>RADIUS OF AREA DRAINED - FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>5</td>
</tr>
<tr>
<td>3/4</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>1-1/4</td>
<td>20</td>
</tr>
<tr>
<td>1-1/2</td>
<td>25</td>
</tr>
</tbody>
</table>

D. Provide P-traps for drains connected to the sanitary sewer.

E. Install floor drains, floor sinks and floor troughs in waterproof floors with waterproof membrane securely flashed with drain flashing clamp so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

F. Position drains so that they are level, accessible and easy to maintain.

3.09 INSTALLATION OF TRAP PRIMERS

A. Install trap primer outlet piping with 1/32” per foot slope towards drain trap where possible.
B. Connect trap primer outlet piping only to factory installed taps on the drain body or P-trap assembly or provide an auxiliary inlet fitting with factory installed trap primer tap.

C. Install trap primer outlet piping in elevated slabs or slabs on grade below concrete reinforcing bars. Wrap with ½” thick flexible unicellular insulation, attach to the reinforcing bars with plastic ties and spacers every five feet to eliminate galvanic corrosion. Refer to Division 22 Section “Plumbing Insulation” for flexible unicellular insulation.

D. Where proper trap primer outlet piping slope can be maintained and the trap primer outlet line would not be subject to freezing, trap primer outlet lines may be installed as follows:

1. Install below elevated floor slabs.
2. Install in the sub grade of slab on grade.

E. Install sleeves and caulk at penetrations through building floor for watertight installation. In an elevated floor slab installation, bracket the piping to bottom of floor once the slab is poured.

F. Refer to Division 22 Section “Water Distribution Piping and Specialties” for trap primer and trap primer inlet pipe requirements.

3.10 INSTALLATION TRAP SEALS:

A. Install trap seals in accordance with manufacturer's written instructions and in locations indicated.

B. Make watertight seal using an adhesive type caulk along bottom of trap seal, if required by the manufacturer.

C. Employ a test plug for testing and remove before normal floor drain use. Clean inside of drain tailpiece and install trap seal after testing.

D. Do not touch elastomeric plug or allow contact with primer or solvent cement.

3.11 CONNECTIONS

A. Piping Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by the plumbing code.

B. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.12 FIELD QUALITY CONTROL

A. Inspections
1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.

2. During the progress of the installation, notify the plumbing official having jurisdiction, at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.
   
a. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.

b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.

c. Reinspections: Whenever the piping system fails to pass the test or inspection, make the required corrections, and arrange for reinspected by the plumbing official.

d. Reports: Prepare inspection reports, signed by the plumbing official.

B. Piping System Test

Test drainage and vent system in accordance with the procedures of the authority having jurisdiction, or in the absence of a published procedure, as follows:

1. Test for leaks and defects all new drainage and vent piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.

2. Leave uncovered and unconcealed all new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.

3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open jointed drain tile, test the piping of plumbing drainage and venting systems upon completion of the rough piping installation. Tightly close all openings in the piping system, and fill with water to the point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before the inspection starts, through completion of the inspection. Inspect all joints for leaks.

4. Final Plumbing Test Procedure: After the plumbing fixtures have been set and their traps filled with water, their connections shall be
tested and proved gas and water-tight. Tightly close all openings, initially except vents thru the roof, in the system and fill the system with smoke from one or more smoke machines designed for smoke testing of plumbing systems. When smoke appears at a vent thru the roof, seal the vent thru roof with a test plug. Pressurize the system with 1” water column of smoke for 15 minutes. Use a "U" tube or manometer inserted in the trap of a water closet to measure this pressure. Visually verify all joints for leaks.

5. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.

6. Reports: Prepare inspection reports and required corrective action signed by the plumbing official and turn over to the Architect upon completion of the project.

3.13 ADJUSTING AND CLEANING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

B. Clean drain strainers, domes, and traps. Remove dirt and debris.

3.14 PROTECTION

A. Protect drains during remainder of construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

END OF SECTION
SECTION 22 14 00

STORM DRAINAGE PIPING AND SPECIALTIES

PART 1 GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section includes building storm drainage piping systems, including drains and drainage specialties.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 22 Section "General Plumbing Requirements," for trenching and backfilling materials and methods for underground piping installations.

2. Division 33 Section "Storm Systems," for storm drainage piping beginning from 5'-0" outside the building.

3. Division 33 Section "Foundation Drainage," for foundation drainage piping.

4. Division 7 Section "Joint Sealers," for materials and methods for sealing pipe penetrations through basement and foundation walls, and fire and smoke barriers.

5. Division 22 Section "Identification for Plumbing Piping and Equipment," for labeling and identification of drainage piping.

6. Division 22 Section "Common Work Results for Plumbing," for materials and methods for fire barrier penetrations, wall and floor penetrations and equipment pads.

7. Division 22 Section "Basic Piping Material and Methods," for materials and methods for mechanical sleeve seals.


1.02 DEFINITIONS

A. Storm Building Drain: That part of the lowest piping of a drainage system which receives the discharge from storm drainage pipes inside the walls of the building and conveys it to the building sewer.
B. Storm Building Sewer: That part of the drainage system which extends from the end of the building drain and conveys its discharge to a public sewer or private sewer or other point of disposal.

C. Drainage System: Includes all the piping within a public or private premises which conveys storm water or other liquid wastes to a point of disposal. It does not include the mains of public sewer systems or a private or public sewage treatment or disposal plant.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. Product data for the following products:
   1. Drainage piping
   2. Drainage piping specialties
   3. Trench drains
   4. Roof drains
   5. Interceptors

C. Test reports specified in Part 3 of this Section.

1.04 [LEED SUBMITTALS]

A. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the provisions of the following codes:
   1. 199_ BOCA National Building Code
   2. 199_ International Plumbing Code

PART 2 PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Drainage Piping Specialties, including backwater valves, expansion joints, cleanouts, area/roof drains, cast-iron trench drains and downspout nozzles:
   b. Sioux Chief Manufacturing Co. Inc.
   d. Tyler Pipe/Wade Div.; Subs. of Tyler Corp.
   e. Watts Industries, Inc.
   f. Zurn Industries, Inc.; Hydromechanics Div.

2. Heavy Duty Hubless Couplings
   a. Anaco Husky HD-2000
   b. Clamp-All 80in. lb.
   c. Ideal Tridon “HD”
   d. Mission Rubber Company “Heavyweight”

3. Downspout Boots
   a. Construction Castings Company
   b. Flockart
   c. Higgins Foundry
   d. Neenah Foundry Company

4. Cast Iron Soil Pipe and Fittings
   a. AB & I Foundry
   b. Charlotte Pipe and Foundry Company
   c. Tyler Pipe / Soil Pipe Division

5. Shielded Transition Couplings
   a. FERNCO, “Proflex 3000 Series”

6. Underground Shielded Adapter Couplings
a. FERNCO, “1056 Series with SR73 Shear Ring”

7. No-Hub Fitting Restraints
   a. Holdrite

2.02 ABOVE GROUND DRAINAGE PIPE AND FITTINGS
   A. Cast-Iron Soil Pipe: CISPI 301 and ASTM A888, hubless pipe and fittings, and bearing the trademark of CIPSI and NSF.
      1. Heavy duty couplings and compression gaskets: ASTM C1540 and meeting FM 1680.
   B. Shielded Transition Couplings: ASTM C1460 with neoprene adapter gasket with stainless steel Shield and hose clamps.

2.03 UNDERGROUND BUILDING DRAIN PIPE AND FITTINGS
   A. Underground Shielded Adapter Couplings: ASTM C1173 with neoprene adapter gasket with stainless steel shield and stainless steel hose clamps.

2.04 DRAINAGE PIPING SPECIALTIES
   A. Cleanout Plugs: As specified on the drawings.
      a. Floor Cleanouts: As specified on the drawings.
   B. Wall Cleanouts: As specified on the drawings.
   C. Roof Drains: As specified on the drawings.

2.05 NO-HUB FITTING RESTRAINTS
   A. Pre-engineered kits of galvanized steel pipe straps with stainless steel band clamps and tee bolts, meeting requirements of the CISPI Installation Handbook.

PART 3 EXECUTION

3.01 PREPARATION FOUNDATION FOR UNDERGROUND BUILDING DRAINS
   A. Pipe Beds:
      1. Cast Iron Soil Pipe: Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand bedding. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation and maintain continuous pipe
slope. For piping with rock trench bottoms, provide sand pipe bed 6” underneath and around sides of pipe, including fittings. After pressure testing is complete, install subbase. Refer to Section “General Plumbing Requirements” for bedding and subbase materials, excavation, trenching, backfill and compaction requirements.

3.02 PIPE APPLICATIONS - ABOVE GROUND, WITHIN BUILDING
A. Install hubless, cast-iron soil pipe and fittings 15” and smaller for storm pipe.

3.03 PIPE APPLICATIONS - BELOW GROUND, WITHIN BUILDING
A. Install hub-and-spigot, service weight, cast-iron, soil pipe and fittings with

3.04 PIPE AND TUBE JOINT CONSTRUCTION
A. Copper Tubing: Solder joints in accordance with the procedures specified in AWS "Soldering Manual."
B. Cast-Iron Soil Pipe: Make hubless joints in accordance with the Cast-Iron Soil Pipe & Fittings Handbook, Chapter IV. Install Couplings as followings:
   1. Install heavy duty hubless couplings on storm drainage piping, including connections to roof drains.
   2. Install No-Hub fitting restraints on joints 5” and larger at:
      a. Changes of direction from vertical to horizontal
      b. 4” branch connections, including tees, wyes and wye combination fittings to storm drainage piping 5” and larger
      c. Horizontal changes of direction 22-1/2 degrees and greater
   C. couplings.

3.05 INSTALLATION
A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing, slope, expansion, and other design considerations. So far as practical, install piping as indicated.
B. Use fittings for all changes in direction and all branch connections.
C. Install piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

F. Install horizontal piping as high as possible allowing for proper slope and coordination with other components. Install vertical piping tight to columns or walls. Provide space to permit insulation applications, with 1-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

G. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and sealer. Refer to Division 22 Section "Basic Piping Materials and Methods" for special sealers and materials.

H. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings and floors, maintain the fire rated integrity. Refer to Division 22 Section "Common Work Results for Plumbing" for special sealers and materials.

I. Elevated Floor Penetrations of Waterproof Membrane, Interior Penetrations of Non-Fire Rated Walls and Concrete Slab on Grade Penetrations: Provide sleeves and seal pipes that pass through waterproof floors, non-fire rated walls, partitions and ceilings or concrete slab on grade. Refer to Division 22 Section "Common Work Results for Plumbing" for special sealers and materials.

J. Foundation Penetrations: Where pipes pass through foundation walls above strip footings or under strip footings, protect pipes from building load with cast iron soil pipe sleeves two pipe sizes larger than the pipe. Sleeves installed under the strip footing shall be encased in concrete.

K. Make changes in direction for drainage piping using appropriate 45 degree wyes, combination wye and eighth bend, or long sweep, quarter, sixth, eighth, or sixteenth bends. Sanitary tees or quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical, except use long-turn pattern combination wye and eighth bends where two fixtures are installed back to back and have a common drain. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper sized standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

L. Install underground building drains to conform with the plumbing code, and in accordance with the Cast Iron Soil Pipe Institute Engineering Manual. Lay underground building drains 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 required gaskets in accordance with manufacturer’s recommendations for use of lubricants, cements, and
other special installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

M. Install drainage piping pitched down at a minimum slope of 1/4 inch per foot (2 percent) for piping 3 inch and smaller, and 1/8 inch per foot (1 percent) for piping 4 inch and larger.

3.06 HANGERS AND SUPPORTS

A. General: Hanger, support, insulation protection shields, and anchor components and installation procedures conforming to MSS SP-58 and SP-69 are specified in Division 22 Section “Hangers and Supports for Plumbing Piping”. Conform to the table below for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable clevis hangers, MSS SP-69 Type 1, for individual horizontal runs.

2. Riser clamps, MSS SP-69 Type 8, for individual vertical runs.

3. Insulation protection shields and high density insulation at each hanger for insulated pipe as specified in Division 22 Sections “Hangers and Supports for Plumbing Piping” and “Plumbing Insulation”.

   a. Install high density insulation on insulated pipe.

C. Install hangers at the following intervals and provide rods of diameter as listed below:

<table>
<thead>
<tr>
<th>Nom. Pipe Size</th>
<th>Steel Pipe Max. Span</th>
<th>Copper Tube Max. Span</th>
<th>Min. Rod Dia. - Inches</th>
<th>Min. Rod Dia. – Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Inches PVC</td>
<td>In Feet</td>
<td>In Feet</td>
<td>Steel or Cast Iron</td>
<td>Copper or</td>
</tr>
<tr>
<td>Up to 3/4</td>
<td>7</td>
<td>5</td>
<td>3/8</td>
<td>3/8</td>
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<tr>
<td>1</td>
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<td>1-1/4</td>
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<td>10</td>
<td>22</td>
<td>18</td>
<td>7/8</td>
<td>3/4</td>
</tr>
</tbody>
</table>
1. Support all sizes of hubless horizontal cast iron piping every five feet, except up to ten feet where ten foot sections are installed. Support all sizes of hubless horizontal cast iron piping every other joint, unless over four feet, then support each joint. Provide support adjacent to joint, not to exceed 18”. Provide sway brace on horizontal piping at not more than 40’ intervals to prevent horizontal movement. Provide support at each horizontal branch.

2. Support all sizes of vertical cast iron piping every ten feet.

3. Support piping within 12” of each elbow or tee.

3.07 INSTALLATION OF PIPING SPECIALTIES

A. Above Ground Cleanouts: Install in above ground piping and building drain piping as indicated, and:
   1. as required by plumbing code;
   2. at each change in direction of piping greater than 45 degrees;
   3. at minimum intervals of 50’ for piping 4” and smaller and 100’ for larger piping;
   4. at base of each vertical soil, waste, or storm water stack.

B. Cleanout Covers: Install floor and wall cleanout covers for concealed piping, types as indicated.

C. Floor Cleanouts: Install in below floor building drain piping at minimum intervals of 50’ for piping 6” and smaller and 75’ for larger piping.

D. Exterior Cleanouts: Install exterior cleanouts embedded in a 18” x 18” x 8” block of concrete, flush with finished grade.

3.08 INSTALLATION OF AREA DRAINS

A. Install area drains in accordance with manufacturer’s written instructions and in locations indicated.

B. Install area drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

C. Refer to architectural documents for floor slope requirements and set area drain elevation to match. Where architectural documents do not indicate the requirements, set the area drain elevation depressed below the finished slab elevation as listed below to provide proper slope to drain:

<table>
<thead>
<tr>
<th>DEPRESSION IN INCHES</th>
<th>RADIUS OF AREA DRAINED - FEET</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>
D. Provide P-traps for drains connected to combined sanitary and storm sewer.

E. Install area drains in waterproof floors with waterproof membrane securely flashed with drain flashing clamp so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

F. Position drains so that they are level, accessible and easy to maintain.

3.09 INSTALLATION OF ROOF DRAINS

A. Install roof drains at low points of roof areas, in accordance with the roof membrane manufacturer's installation instructions.

B. Install drain flashing collar or flange so that no leakage occurs between roof drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated.

C. Position roof drains so that they are accessible and easy to maintain.

3.10 FIELD QUALITY CONTROL

A. Inspections

1. Do not enclose, cover, or put into operation the storm drainage piping system until it has been inspected and approved by the authority having jurisdiction.

2. During the progress of the installation, notify the plumbing official having jurisdiction, at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.

   a. Rough-in Inspection: Arrange for inspection of the storm drainage piping system before concealed or closed-in after system is roughed-in.

   b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.
c. Reinspections: Whenever the piping system fails to pass the test or inspection, make the required corrections, and arrange for reinspected by the plumbing official.

d. Reports: Prepare inspection reports, signed by the plumbing official.

B. Piping System Test: Test storm drainage system in accordance with the procedures of the authority having jurisdiction, or in the absence of a published procedure, as follows:

1. Test for leaks and defects all new storm drainage piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.

2. Leave uncovered and unconcealed all new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.

3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open jointed drain tile, test the piping of storm drainage piping systems upon completion of the rough piping installation. Tightly close all openings in the piping system, and fill with water to the point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before the inspection starts, through completion of the inspection. Inspect all joints for leaks.

4. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.

5. Reports: Prepare inspection reports and required corrective action signed by the plumbing official and turn over to the Architect upon completion of the project.

3.11 ADJUSTING AND CLEANING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

B. Clean drain strainers and domes. Remove dirt and debris.

3.12 PROTECTION

A. Protect drains during remainder of construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.
B. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

END OF SECTION
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SECTION 22 15 00

GENERAL SERVICE COMPRESSED AIR SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes piping, equipment, and related accessories, for general building, compressed air systems operating at 200 psig and below.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Concrete Work" for specifications on concrete and reinforcing materials and concrete placing requirements for equipment pads.

2. Division 7 Section "Joint Sealants," for materials and methods for sealing pipe penetrations through basement and foundation walls, and fire and smoke barriers.

3. Division 22 Section "Coordination" for basic requirements for electrical components that are an integral part of packaged system components.

4. Division 22 Section, “Common Work Results for Plumbing” for materials and methods for fire barrier penetrations, wall and floor penetrations and concrete equipment pads.

5. Division 22 Section "Basic Piping Materials and Methods" for flexible metal braid connectors, pipe joining materials, specialties, unions, dielectric unions, dielectric flanges, dielectric flange kits and basic installation requirements.

6. Division 22 Section "Meters and Gauges for Plumbing Piping" for thermometers, pressure gauges, and fittings.

7. Division 22 Section "Hangers and Supports for Plumbing Piping" for equipment and piping hangers and supports.

8. Division 22 Section "Vibration Isolation for Plumbing Piping and Equipment" for inertia pads, isolation pads, spring supports, and spring hangers.

9. Division 22 Section "Seismic Controls for Plumbing Piping and Equipment" for field-installed seismic restraint devices used for equipment and piping systems.
1. Division 26 Section “Common Work Results for Electrical” required electrical devices.

10. Division 26 Sections "Enclosed Switches and Circuit Breakers" for field-installed disconnects.

1.02 DEFINITIONS

A. Low-Pressure Compressed Air Systems: ASME B31.9 "Building Services Piping" for systems operating at pressure of 125 psig or less, and temperature 200 deg F or less.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories for all equipment; indicating dimensions, required clearances, and methods of assembly of components, and piping and wiring connections.

C. Wiring diagrams from manufacturers detailing electrical requirements for electrical power supply wiring to equipment. Include ladder-type wiring diagrams for interlock and control wiring required for final installation. Differentiate between portions of wiring that are factory-installed and portions that are field-installed.

D. Certificates of shop inspection and data report as required by provisions of the ASME Boiler and Pressure Vessel Code.

E. Coordination drawings for compressed air systems in accordance with Division 22 Section "General Plumbing Requirements."

F. Maintenance data for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."

1.04 QUALITY ASSURANCE

A. Electrical Component Standard: NFPA 70 "National Electrical Code."

B. Listing and Labeling: Provide equipment that is listed and labeled.

1. Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

3. Furnish control panels manufactured in accordance with UL 508A.
C. ASME Code Compliance: Provide system components complying with the following:

1. Receiver Tanks: Comply with ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels, and bear the appropriate code symbols.

2. Safety Valves: ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels, National Board certified, bear the appropriate labeling, and have been factory-sealed after

3. Low-Pressure Systems Piping: ASME B31.9, Building Services Piping.

D. Pipe, pipe fittings and pipe specialties shall be manufactured in plants located in the United States or certified to meet the specified ASTM and ANSI standards.

E. Design Concept: The Drawings indicate capacities, sizes, and dimensional requirements of system components. Components having equal performance characteristics that deviate from the indicated size and dimensions may be considered, provided deviations do not change the design concept or intended performance. The burden of proof for equality of products is on the proposer. Refer to Division 1.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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

1. Splash Lubricated, Reciprocating Air Compressors:
   a. Champion Pneumatic Machinery Co., Inc.
   b. Gardner-Denver Products, Industrial Machinery; Cooper Industries.
   c. Ingersoll-Rand Co.
   d. Powerex.
   e. Quincy Compressor Div.; Coltec Industries, Inc.
   f. Saylor-Beall Manufacturing Co.

2. Air Dryers:
   a. Arrow Pneumatics, Inc.
b. Champion Pneumatic Machinery Co., Inc.

c. Deltech Engineering, L.P.

d. Hankison Div.; Hansen, Inc.

e. Ingersoll-Rand Co.

f. Saylor-Beall Manufacturing Co.

g. Sullair Corp. Subsid.; Sundstrand Corp.

h. Ultrafilter, Inc.

i. Van Air Systems, Inc.

j. Zeks Air Drier Corp.

3. Air Filters:

a. Deltech Engineering, L.P.

b. Hankison Div.; Hansen, Inc.

c. Ingersoll-Rand Co.

d. Ultrafilter, Inc.

e. Zurn Industries

4. Automatic Drain Valves:

a. Arrow Pneumatics, Inc.

b. Deltech Engineering, L.P.

c. Ingersoll-Rand Co.

d. Zurn Industries

5. Ball Valves – 2” and smaller:

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<th>MANUFACTURER</th>
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<th>SOLDER ENDS</th>
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6. Check Valves – 2” and smaller:
### MANUFACTURER

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<th>THREADED ENDS</th>
<th>SOLDER ENDS</th>
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<td>Nibco</td>
<td>T-413-Y</td>
<td>S-413-Y</td>
</tr>
</tbody>
</table>

### 2.02 PIPE AND TUBE MATERIALS

A. Copper Tube: ASTM B 88, Type K or Type L, Seamless, Water Tube, hard-drawn temper.

### 2.03 PIPE AND TUBE FITTINGS

A. Copper Tube Fittings: ASME B16.22, wrought copper or copper alloy, solder-joint, pressure type.

### 2.04 VALVES

A. Ball Valves, 2 Inch and Smaller: MSS SP-110, Class 150 saturated steam pressure, 600-psi CWP; two-piece construction; with bronze body conforming to ASTM B 584, full port, chrome-plated brass ball, replaceable PTFE (Teflon) seats and seals, blowout-proof stem, and vinyl-covered steel handle. Provide solder ends for use with copper tubing or threaded ends for use with steel piping. Provide Class 150 valves meeting the above where system pressure requires. Provide with side vented ball where required.

B. Swing Check Valves, 2-Inch and Smaller: MSS SP-80; Class 125, 200-psi CWP, cast-bronze body and cap conforming to ASTM B 62; with horizontal swing, Y-pattern, and PTFE (Teflon) disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150, 300-psi CWP, valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.

### 2.05 JOINING MATERIALS

A. Screwed Joint Pipe Tape: Polytetrafluoroethylene (PTFE) plastic.

B. Solder Filler Metal: ASTM B 32, Alloy Sb5 (95 percent tin and 5 percent antimony), with 0.20 percent maximum lead content.

### 2.06 SIMPLEX RECIPROCATING AIR COMPRESSORS

A. Provide factory-assembled and tested, simplex, packaged, air-cooled, continuous duty, piston-type, motor-driven air compressors as indicated, of capacities and having electrical characteristics indicated on the drawings, and with the following features:

1. Belt guard totally enclosing pulleys and belts.
2. Receivers: 150psi 250psi ASME-code-construction horizontal, vertical receiver with safety valve, pressure gauge, and automatic drain.

3. Inlet silencer filter

4. Safety valves

5. Shutoff valve.

B. Controls: NEMA 1 enclosure, lockable combination circuit breaker magnetic motor starter and 3 leg overload protection for each motor, compressor hand-off-automatic selector switch, overload relay, reset, 120V control circuit transformer fused on primary and secondary, low oil level shutdown switch and alarm light, high temperature alarm shutdown switch and alarm light and run time clock. Circuit breaker shall have minimum AIC rating as indicated on the Electrical Drawings. Control panel shall have a unit short circuit current rating equal to or greater than the available short circuit current as indicated on the electrical drawings. Controls shall be configured for terminating one incoming power feeder.

C. Disconnect: Disconnect is provided under Division 26.

D. Tank-Mounted, Reciprocating Air Compressors: Two stage, single acting, splash lubricated with centrifugal unloader for loadless starting, crank shaft roller bearings and belt guard mounted air cooled aftercooler. Each compressor shall be equipped with a belt driven, high efficiency, dripproof, continuous duty, ball bearing, induction type motor mounted on adjustable slide base and provided with a totally enclosed drive guard.

2.07 AIR DRYERS

A. Air Dryers, Refrigerated Type: Provide with capacities and characteristics as indicated on the drawings. Equip with drain connection.

2.08 ACCESSORIES

A. General: Provide accessories having working pressure rating not less than system pressure at location where used, and compatible with equipment and piping system used.

B. Safety Valves: ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels construction, National Board certified, labeled, and factory-sealed; constructed of bronze body with poppet safety valve for compressed air service.

1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

C. Filters: Capacities and types indicated on the drawings. Equip with cartridges capable of removing particles, water and oil aerosols, and with
warning light to indicate when selected maximum pressure drop has been exceeded with characteristics indicated on the drawings.

D. Automatic Drain Valves: Electronic controlled corrosion-resistant metal body and internal parts, rated for 200-psig minimum working pressure, capable of automatic discharge of collected condensate.

**PART 3 EXECUTION**

3.01 CONCRETE EQUIPMENT BASES

A. Refer to Division 22 Section “Common Work Results for Plumbing” for concrete equipment bases.

1. Form concrete equipment bases by using framing lumber with form release compounds. Chamfer top edge and corners of pad.

2. Install reinforcing bars, tied to frame, and place anchor bolts and sleeves using manufacturer's installation template.

3. Place concrete and allow to cure before installation of pumps.

3.02 EQUIPMENT INSTALLATION

A. Install air compressors on concrete bases. Set and connect units in accordance with manufacturers' written installation instructions. Install units plumb and level, firmly anchored, in locations indicated, and maintain manufacturers' recommended clearances. Orient so equipment controls and devices needing servicing are accessible. For indirect drain material and installation.

B. Install seismic restrains for equipment as indicated refer to Division 22 Section "Seismic Controls for Plumbing Piping and Equipment".

C. Install flexible connectors where indicated on the drawings. Refer to Division 22 “Basic Piping Material and Methods” for installation.

D. Install indirect drains on air compressor accumulator tank drain valve, air dryer condensate drain and each automatic air drain valve and route to nearest floor drain. Refer to Division 22 Section “Sanitary Drainage and Vent Piping and Specialties”.

E. Provide equipment pad and vibration isolation, refer to Division 22 Section “Vibration Isolation For Plumbing Piping & Equipment”.

F. Provide equipment pad, concrete inertia base and vibration isolation, refer to Division 22 Section “Vibration Isolation For Plumbing Piping & Equipment”.
3.03 PIPING APPLICATIONS

A. Low-Pressure Systems: Use the following pipe and fittings:

1. 2 Inches and Smaller: Copper tube with copper and copper alloy solder fittings; soldered joints.

3.04 JOINT CONSTRUCTION

A. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe tape, suitable for the service for which the pipe is intended, on the male threads at each joint. Tighten joint to leave not more than 3 threads exposed.

B. Brazed and Soldered Joints: For copper tube and fittings, braze and solder joints in accordance with ASME B31 - Standard Code for Pressure Piping.

1. Braze joints in accordance with ASME B31.1 - Power Piping with BAg-5 brazing filler metal

2. Solder joints in accordance with ASME B31.9 - Building Service Piping.

3. Thoroughly clean tube surface and inside surface of the cup of the fittings, using very fine emery cloth, prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux shall not be used as the sole means for cleaning tube and fitting surfaces.

4. Mechanical Joints: Follow grooved-end mechanical coupling manufacturer's written instructions.

3.05 VALVE APPLICATIONS

A. General-Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shut-off duty - 2” and smaller: Use 2-piece ball valves.

   a. Provide side vented ball valves only at individual equipment connections and air drops to relieve air downstream of ball valve when closed for equipment repair or removal.

3.06 INSTALLATION OF VALVES

A. Sectional Valves: Install sectional valves on each branch and riser, close to main, and elsewhere as indicated.
B. Shutoff Valves: Install shutoff valves on outlet of each compressed air equipment item, on each supply to each compressed air outlet, and elsewhere as indicated.

C. Locate valves for easy access and provide separate support where necessary. Provide access doors and fire rated access doors as required.

D. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full handle rotation.

G. Installation of Check Valves: Install for proper direction of flow as follows:

   1. Swing Check Valves: Horizontal position with hinge pin level.

3.07 PIPING INSTALLATION, GENERAL

A. Install air and drain piping with 1/8-inch-per-foot slope downward in direction of air flow.

B. Install eccentric reducers where pipe is reduced in size in the direction of flow, with bottoms of both pipes and reducer flush.

C. Connect branch air piping to mains from top of main. Provide drain leg and drain trap at end of each main, each branch, and each low point in piping system.

D. Install horizontal piping as high as possible. Install vertical piping tight to columns or walls. Provide space to permit insulation applications, with 1 inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

E. Install piping specialties in accordance with Division 22 Section "Basic Piping Materials and Methods."

F. Install supports and anchors in accordance with Division 22 Section "Hangers and Supports for Plumbing Piping."

   1. Spacing: Do not exceed 10'-0" spacing between pipe hangers.

G. Install valves in accordance with Division 22 Section "General Duty Valves for Plumbing Piping."

H. Install thermometers and pressure gauges in accordance with Division 22 Section "Meters and Gauges for Plumbing Piping."
I. Fire Barrier Penetrations: Where pipes pass through fire-rated walls, partitions, ceilings, and floors, maintain the fire-rated integrity. Refer to Division 22 Section "Common Work Results for Plumbing" for special sealers and materials.

J. Exterior Wall Penetrations: Seal pipe penetrations through exterior wall constructions with sleeves packing, and sealant. Refer to Division 22 Section "Basic Piping Materials and Methods" for additional information.

K. Elevated Floor Penetrations of Waterproof Membrane, Interior Penetrations of Non-Fire Rated Walls and Concrete Slab on Grade Penetrations: Provide sleeves and seal pipes that pass through waterproof floors, non-fire rated walls, partitions and ceilings or concrete slab on grade. Refer to Division 22 Section "Common Work Results for Plumbing" for special sealers and materials.

L. Joints at Valve Assemblies: Provide unions downstream of shutoff valves at valve assemblies. Unions are not required at flanged connections. Unions are specified in Division 22 section "Basic Piping Materials and Methods".

3.08 HANGERS AND SUPPORTS

A. General: Hanger, support, insulation protection shield, and anchor components and installation procedures conforming to MSS SP-58 and SP-69 are specified in Division 22 Section "Hangers and Supports for Plumbing Piping." Conform to the table below for maximum spacing of supports.

B. Pipe Attachments: Install the following:

1. Adjustable band hangers, MSS SP-69 Type 7, for steel pipe for individual horizontal runs and for copper tube for horizontal runs.

2. Plastic coated adjustable band hangers with, MSS SP-69 Type 7, for copper tube for horizontal runs.

3. Plastic coated steel riser clamps, MSS SP-69 Type 8, for individual vertical runs of copper tube.

4. Copper coated extension split ring pipe clamp, MSS SP-69 Type 12, for individual vertical exposed runs of copper tube 2" and smaller on walls or for securing copper tube inside walls.

C. Install hangers for horizontal piping with the following maximum spacing and minimum rod sizes:

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<td>7</td>
<td>5</td>
<td>3/8</td>
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1. Support vertical steel pipe at each floor.

2. Support vertical copper tube at each floor and in intervals not to exceed 10 feet.

D. Support piping within 12" of each elbow or tee and for piping 2-1/2" and larger at each valve or strainer.

E. Support piping above the floor with pipe supports attached to the floor with anchor bolts where indicated on the drawings. Conform to the table above for maximum spacing of supports.

3.09 CONNECTIONS

A. Install piping adjacent to equipment to allow servicing and maintenance.

B. Connect air piping to units with shutoff valves and unions.

1. Where air piping connections are dissimilar metals, install dielectric waterway fittings or dielectric unions for joints 2" and smaller and dielectric flanges for joints 2-1/2" and larger. Dielectric waterway fittings, unions and flanges are specified in Division 22 Section "Basic Piping Materials and Methods."

2. Install pressure gauges on compressor discharge piping, on receiver tanks, and where indicated.

C. Install safety valves in receiver tanks, in quantity and size to relieve capacity not less than that of connected compressor.

D. Install automatic drain valves on intercoolers, aftercoolers, separators, receivers, dryers, filters and other locations indicated. Discharge condensate over nearest floor drain.

E. Install flexible connectors where indicated in accordance with Division 22 Section "Basic Piping Materials and Methods".

F. Securely attach hose reels to the structure as specified in Division 22 Section "Hangers and Supports for Plumbing Piping."
G. Electrical Connections:

1. Power wiring is specified in Division 26 Section “Common Work Results for Electrical”

2. Field-installed disconnects are specified in Division 26 Sections "Enclosed Switches and Circuit Breakers".

3. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

3.10 FIELD QUALITY CONTROL

A. General: Provide the services of a factory-authorized service representative to test and inspect unit installation, provide startup service, and to demonstrate and train Owner's maintenance personnel as specified below.

1. Test and adjust operating and safety controls. Replace damaged and malfunctioning controls and equipment.

B. Piping System Tests: Cap and fill new and parts of existing systems that have been modified, with oil-free, dry air or gaseous nitrogen, to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate the test source and let stand for 4 hours to equalize temperature. Refill system, if required, to test pressure and hold pressure for 2 hours with no drop in pressure.

1. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

3.11 STARTUP

A. Preparation: Perform the following final checks before startup:

1. Complete tests of piping systems.

2. Check for piping connection leaks.

3. Check lubricating oil for lubricated-type equipment.

4. Check V-belts for proper tension.

5. Check that compressor inlet filters and piping are clear.

6. Check equipment vibration-control supports and flexible pipe connectors, and that equipment is properly attached to substrate.

7. Check for proper seismic restraints.
8. Check that safety valves have correct setting; greater than compressor discharge pressure, but not greater than pressure rating of system components.

9. Test operation of equipment safety controls and devices.

10. Check water supply to water-cooled equipment.

11. Check water supply to liquid-ring air compressors.

12. Drain receiver tanks.

13. Check for adequate room ventilation.

B. Starting Procedures: Follow the manufacturer's written procedures. If no procedures are prescribed by the manufacturer, proceed as follows:

1. Energize circuits.

2. Start and run equipment through complete sequence of operations.


4. Check air pressures.

5. Manually operate safety valves.

6. Adjust operating controls including pressure settings.

3.12 TRAINING

A. General: At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel for a minimum of two hours on the operation and maintenance of the equipment provided under this section.

B. Content: Training shall include but not be limited to:

1. Overview of the system and/or equipment as it relates to the facility as a whole.

2. Operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention.

3. Review data included in the operation and maintenance manuals. Refer to Division 1 Section "Operating and Maintenance Data."
C. Certification: Contractor shall submit to the Engineer a certification letter stating that the Owner’s designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The certification letter shall be signed by the Contractor and the Owner’s representative indicating agreement that the training has been provided.

D. Schedule: Schedule training with Owner with at least 7 days’ advance notice.

END OF SECTION
SECTION 22 33 00

ELECTRIC DOMESTIC WATER HEATERS

PART 1  GENERAL

1.01  SUMMARY

A. This Section includes electric water heaters.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section “Concrete Work” for specifications on concrete and reinforcing materials and concrete placing requirements for equipment pads.

2. Division 22 Section “Common Work Results for Plumbing” for concrete equipment pads.

3. Division 22 Section “Basic Piping Materials and Methods” for pipe joining materials, unions, dielectric unions, dielectric flanges, dielectric flange kits and basic installation requirements.

4. Division 26 Section “Common Work Results for Electrical” required electrical devices.

5. Division 26 Section “Enclosed Switches and Circuit Breakers” for field-installed disconnects.

1.02  SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories, and indicating dimensions, required clearances, and methods of assembly of components, and piping and wiring connections.

2. Wiring diagrams from manufacturers detailing electrical requirements for electrical power supply wiring to water heaters. Include ladder-type wiring diagrams for interlock and control wiring required for final installation of water heaters and controls. Differentiate between portions of wiring that are factory installed and portions that are to be field installed.

3. Certificates of shop inspection and data report as required by provisions of the ASME Boiler and Pressure Vessel Code.
4. Maintenance data for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."

1.03 LEED SUBMITTALS
A. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1, Section 7 - "Service Water Heating."

1.04 QUALITY ASSURANCE
A. UL Standards: Provide water heaters complying with the following:
   1. UL 1453, "Electric Booster and Commercial Storage Tank Water Heaters."

B. Electrical Component Standard: Provide components complying with NFPA 70 "National Electrical Code."

C. Listing and Labeling: Provide water heaters that are listed and labeled.
   1. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

D. ASME Code Compliance: Provide water heaters and safety relief valves that comply with ASME Boiler and Pressure Vessel Code and that bear the appropriate code symbols.

E. State Boiler Code Compliance: Provide rated water heaters, safety relief valve and accessories that comply with the state boiler code in effect.

F. ASHRAE Standards: Provide water heaters with performance efficiencies not less than prescribed in ASHRAE 90.1b, "Energy Conservation in New Building Design."

G. Design Concept: The drawings indicate types and capacities of water heaters and are based on specific descriptions and manufacturers indicated. Water heaters having equal performance characteristics by other manufacturers may be considered provided that deviations in capacities, dimensions, operation, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of water heaters is on the proposer.
1.05 WARRANTY

A. Special Project Warranty: Submit a written warranty, executed by manufacturer, agreeing to repair or replace water heater units that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, controls, tanks, and coils. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

1. Commercial Electric Water Heaters:
   a. Tank: Ten years
   b. Controls and Other Components: One year

2. Commercial Electric ASME Water Heaters:
   a. Tank: Ten years
   b. Controls and Other Components: One year

PART 2 PRODUCTS

2.01 MANUFACTURERS

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

1. Commercial ASME Electric Water Heaters:
   a. PVI Industries, Inc. with no substitutions

2. Thermal Expansion Tanks
   a. Armstrong Pumps, Inc.
   b. Amtrol, Inc.
   c. Bell & Gosset, ITT
   d. TACO, Inc.
   e. Watts
   f. Wessels Tank Co.

2.02 ASME ELECTRIC WATER HEATERS

A. Description: Automatic, commercial, electric; with vertical, ASME labeled, 150-psig-rated storage tank, integral controls, drain valve, and relief valve.
B. Description: Automatic, commercial electric; with horizontal, ASME labeled, 150-psig-rated storage tank, circulating pump, integral controls, drain valve, and relief valve.

C. Insulation: Fiberglass or polyurethane foam, surrounding tank.

D. Jacket: Steel, with baked-on enamel finish.

2.03 "AQUAPLEX STAINLESS STEEL WITH DRAIN VALVE. THERMAL EXPANSION TANKS

A. ASME Thermal Expansion Tanks: Provide size and number as indicated; construct of welded carbon steel ASME labeled for 150 psig working pressure, 200 deg F maximum operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a FDA approved butyl rubber diaphragm securely sealed into tank. Provide taps for pressure gauge and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base. Tank, with taps and supports, shall be constructed, tested, and labeled in accordance with ASME Pressure Vessel Code, Section VIII, Division 1.

B. Thermal Expansion Tanks: Provide size and number as indicated; construct of welded carbon steel listed for 150 psig working pressure, 200 deg F maximum operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a FDA approved butyl rubber diaphragm securely sealed into tank. Provide taps for pressure gauge and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base.

PART 3 EXECUTION

3.01 CONCRETE EQUIPMENT BASES

A. Construct concrete equipment bases in accordance with Division 22 Section “Common Work Results for Plumbing” for concrete and setting of equipment.

3.02 WATER HEATER INSTALLATION

A. General: Install water heaters on concrete equipment bases. Set and connect units in accordance with manufacturer's written installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances. Orient so controls and devices needing servicing are accessible.

B. Install thermometers on water heater outlet piping. Thermometers are specified in Division 22 Section "Meters and Gauges for Plumbing Piping."
3.03 EXPANSION TANK INSTALLATION

A. Support expansion tank from structure. Do not hang expansion tank from piping.

B. Charge expansion tank bladder with air to a pressure equal to the domestic water static pressure.

3.04 CONNECTIONS

A. Piping installation requirements are specified in other Sections of Division 22. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping adjacent to equipment arranged to allow servicing and maintenance.

2. Connect hot and cold water piping to units with shutoff valves and unions. Connect hot water circulating piping to unit with shutoff valve, check valve, and union. Extend relief valve discharge to closest floor drain.
   a. Where water heater piping connections are dissimilar metals, install dielectric waterway fittings or dielectric unions for joints 2” and smaller and install dielectric flanges for joints 2-1/2” and larger. Dielectric waterway fittings, unions and flanges are specified in Division 22 Section "Basic Piping Materials and Methods."
   b. Install vacuum relief valve in cold water inlet piping.

3. Install drain as indirect waste to spill into open drain or over floor drain.
   a. Install drain valve at low point in water piping, for water heaters not having tank drain.

4. Install heat traps at inlet and outlet of each water heater storage tank. Heat trap shall be made of elbows and piping. Heat trap shall turn down to 12” below the outlet or inlet, run 12” horizontal and turn up to the cold water to the heater or hot water from the heater. Where multiple tanks are connected with a manifold, a single heat trap may be provided at the connection of the cold water supply to the cold water manifold together.

B. Electrical Connections:

1. Power wiring is specified in Division 26 Section “Common Work Results for Electrical”
2. Field-installed disconnects are specified in Division 26 Sections "Enclosed Switches and Circuit Breakers".

3. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

3.05 FIELD QUALITY CONTROL

A. General: Provide the services of a factory-authorized service representative to test and inspect unit installation, provide start-up service, and demonstrate operation of equipment as specified below.

1. Test and adjust operating and safety controls. Replace damaged and malfunctioning controls and equipment.

3.06 STARTUP

A. Perform the following before start-up final checks:

1. Fill water heaters with water.
2. Piping systems test complete.
3. Check for piping connections leaks.
4. Test operation of safety controls and devices.

B. Perform the following start-up procedures:

1. Energize circuits.
2. Adjust operating controls.
3. Adjust hot water outlet temperature setting.

3.07 TRAINING

A. General: At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel for a minimum of two four eight hours on the operation and maintenance of the equipment provided under this section.

B. Content: Training shall include but not be limited to:

1. Overview of the system and/or equipment as it relates to the facility as a whole.
2. Operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention.
3. Review data included in the operation and maintenance manuals. Refer to Division 1 Section "Operating and Maintenance Data."

C. Certification: Contractor shall submit to the Engineer a certification letter stating that the Owner’s designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The certification letter shall be signed by the Contractor and the Owner's representative indicating agreement that the training has been provided.

D. Schedule: Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION
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**SECTION 22 40 00**

**PLUMBING FIXTURES**

**PART 1  GENERAL REQUIREMENTS**

1.01 SUMMARY

A. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Joint Sealers," for materials and methods for sealing between plumbing fixtures and interior walls.

2. Division 22 Section "General Duty Valves for Plumbing Piping" for valves used as supply stops.

C. Products furnished but not installed under this Section include:

1. Plumbing fittings (including faucets) and piping indicated, for fixtures, appliances, appurtenances, and equipment provided by Owner.

2. Plumbing fittings (including faucets) and piping indicated, for fixtures, appliances, appurtenances, and equipment specified in other Sections.

D. Products installed but not furnished under this Section include:

1. Owner-supplied fixtures, as indicated.

2. Accessories, appliances, appurtenances, and equipment specified in other Sections, requiring plumbing services or fixture-related devices, as indicated.

1.02 DEFINITIONS

A. Accessible: Describes a plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped people.

Examples of accessory below are toilet seats, grab bars, and soap dishes.

B. Accessory: Device that adds effectiveness, convenience, or improved appearance to a fixture but is not essential to its operation.
C. Appliance: Device or machine designed and intended to perform a specific function.

D. Appurtenance: Device or assembly designed to perform some useful function when attached to or used with a fixture.

E. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.

F. Fitting: Fitting installed on or attached to a fixture to control the flow of water into or out of the fixture.

G. Fixture: Installed receptor connected to the water distribution system, that receives and makes available potable water and discharges the used liquid or liquid-borne wastes directly or indirectly into the drainage system. The term "Fixture" means the actual receptor, except when used in a general application where terms "Fixture" and "Plumbing Fixture" include associated trim, fittings, accessories, appliances, appurtenances, support, and equipment.

H. Roughing-In: Installation of piping and support for the fixture prior to the actual installation of the fixture.

I. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required. Categories of supports are:

1. Carrier: Floor-mounted support for wall-mounted water closet, and support fixed to wall construction for wall-hung fixture.

2. Chair Carrier: Support for wall-hung fixture, having steel pipe uprights that transfer weight to the floor.

3. Chair Carrier, Heavy Duty: Support for wall-hung fixture, having rectangular steel uprights that transfer weight to the floor.

4. Reinforcement: Wood blocking or steel plate built into wall construction, for securing fixture to wall.

J. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

K. Lead Free: Refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤0.25% per Safe Drinking Water Act as amended January 4th 2011 Section 1417.
1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

2. Wiring diagrams for field-installed wiring of electrically operated units.

3. Maintenance data for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."

B. Submit certification that faucets and trim for domestic water distribution for drinking or cooking comply with NSF 61 Annex G and / or NSF 372. The following faucets and trim need not comply:

1. Electronic faucets

2. Service sink faucets

3. Flush valves

4. Shower valves and heads

C. LEED Submittals

[Product Data for Prerequisite WE 1: Documentation indicating flow and water consumption requirements.

1.04 QUALITY ASSURANCE


B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

C. Comply with NSF 61 Annex G and / or NSF 372 for wetted surfaces of faucets and trim containing no more than 0.25% lead by weight for domestic water distribution for drinking or cooking.

D. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixtures having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of plumbing fixtures is on the proposer.

1.05 SPARE PARTS

A. Deliver spare parts to Owner. Furnish spare parts described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.

B. Faucet Washers and O-rings: Furnish quantity of identical units not less than 10 percent of amount of each installed.

C. Faucet Cartridges and O-rings: Furnish quantity of identical units not less than 5 percent of amount of each installed.

D. Flushometer Repair Kits: Furnish quantity of identical units not less than 10 percent of amount of each flushometer installed.

E. Provide individual metal boxes or a hinged-top wood or metal box having separate compartments for each type and size of above extra materials.

F. Water Closet Tank Repair Kits: Furnish quantity of identical flush valve units not less than 5 percent of amount of each type installed.

G. Toilet Seats: Furnish quantity of identical units not less than 5 percent of amount of each type toilet seat installed.

PART 2 PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed for that category:

1. Water Closets:
   a. American Standard, Inc.
b. Crane Plumbing/Fiat Products.
c. Gerber Plumbing Fixture Corp.
d. Kohler Co.
e. Sloan Valve Co.
f. TOTO KIKI USA, Inc.
g. Zurn Plumbing Products Group

2. Urinals:
   a. American Standard, Inc.
   b. Crane Plumbing/Fiat Products.
   c. Gerber Plumbing Fixture Corp.
   d. Kohler Co.
   e. Sloan Valve Co.
   f. TOTO KIKI USA, Inc.
   g. Zurn Plumbing Products Group

3. Lavatories:
   a. American Standard, Inc.
   b. Crane Plumbing/Fiat Products.
   c. Gerber Plumbing Fixture Corp.
   d. Kohler Co.
   e. Sloan Valve Co.
   f. TOTO KIKI USA, Inc.
   g. Zurn Plumbing Products Group

4. Sinks:
   a. Advance Tabco
   b. Elkay Manufacturing Co.
   c. Just Manufacturing Co.
d. Kohler Co.

5. Mop Basins:
   a. Acorn Engineering Co.
   b. Crane Plumbing/Fiat Products.
   c. Stern-Williams Co., Inc.

6. Water Coolers:
   a. Acorn / Aqua
   b. Elkay Manufacturing Co.
   c. Halsey Taylor; A Household International Co.
   d. Haws Drinking Faucet Co.

7. Outlet Boxes:
   a. Guy Gray Manufacturing Co., Inc.
   b. Symmons Industries, Inc.
   c. Oatey Co.

8. Emergency Equipment:
   a. Bradley Corp.
   b. Chicago Faucet Co.
   c. ENCON Safety Products
   d. Guardian Equipment.
   e. Haws Drinking Faucet Co.
   f. Speakman Co.
   g. Water Saver Faucet Co.

9. Toilet Seats:
   c. Church Seat Co.
d. Kohler Co.
e. Olsonite Corp.
f. Sperzel Industries, Inc.

10. Flushometers:
   a. Coyne & Delany Co.
   b. Sloan Valve Co.

11. Commercial Pressure Balance Bath/Shower Faucets:
   a. Acorn Engineering Co.
   b. Bradley Corp.
   c. Lawler Manufacturing Co., Inc.
   d. Leonard Valve Co.
   e. Powers Process Controls; A Unit of Mark Controls Corp.
   f. Speakman Co.
   g. Symmons Industries, Inc.

12. Sensor-Operated Faucets and Devices:
   a. Sloan Valve Co.
   b. Zurn Industries, LTD. “Aqua Spec”

13. Stop Valves & Supplies:
   a. Brass Craft Subsidiary; Masco Co.
   b. Engineered Brass Company
   c. McGuire Manufacturing Co., Inc.
   d. PROFLO
   e. Watts Brass and Tubular
   f. Zurn Industries

14. P-traps, Drains & Miscellaneous Fittings:
a. Brass Craft Subsidiary; Masco Co.
b. Dearborn Brass
c. Engineered Brass Company
d. McGuire Manufacturing Co., Inc.
e. PROFLO
f. Watts Brass and Tubular
g. Zurn Industries

15. Supports:
a. Josam Co.
c. Wade Div.; Tyler Pipe.
d. Watts Drainage Products
e. Zurn Industries, Inc.; Hydromechanics Div.

16. Insulation Kits
a. Brocar
b. McGuire
c. Plumberex
d. PROFLO
e. Trap-Wrap
f. Truebro, Inc.

2.02 PLUMBING FIXTURES, GENERAL
A. Provide plumbing fixtures and trim, fittings, other components, and supports as specified on the drawings and below:

2.03 FAUCETS
A. Faucets General: As described on the drawings.
   1. Electronic faucets shall be of the same manufacturer as the water closet and urinal flush valves.
2.04 STOP VALVES & SUPPLIES
A. Supplies General: As described on the drawings.
   1. Exposed piping and parts shall be polished chrome plated.

2.05 P-TRAPS, DRAINS AND MISCELLANEOUS FITTINGS:
A. Fittings General: As described on the drawings, except as listed below.
   1. Exposed piping and fittings shall be polished chrome plated.
   2. Fittings installed concealed inside a plumbing fixture or within wall construction may be without chrome plate finish.
   3. Fitting and faucet bodies for domestic water distribution shall be of lead free brass or lead free cast bronze.

B. Sink Continuous Wastes: Polished chrome-plated, tubular brass, 1-1/2 inches, 17 gauge, with brass nuts on slip inlets, and of configurations indicated.

C. Skullery sink Continuous Wastes: Polished chrome-plated, tubular brass, 2 inches, 17 gauge, with brass nuts on slip inlets, and of configurations indicated.

D. Escutcheons: Wall flange with set screw.

E. Escutcheons: Polished chrome-plated, sheet steel wall flange with friction clips.

F. Deep Pattern Escutcheons: Wall flange with set screw or sheet steel wall flange with friction clips, of depth adequate to conceal protruding roughing-in fittings.

2.06 FLUSHOMETERS
A. Provide flushometers compatible with fixtures, with features and of consumption indicated As described on the drawings.
   1. Exposed metal parts shall be polished chrome plated.
   2. Flush valves installed within wall construction may be without chrome plate finish.

2.07 TOILET SEATS
A. General: As described on the drawings.
2.08 PLUMBING FIXTURE SUPPORTS

A. Supports: ASME A112.6.1M, categories and types as required for wall-hanging fixtures specified, and wall reinforcement.

B. Support categories are:

1. Carriers: Supports for wall-hanging water closets and fixtures supported from wall construction. Water closet carriers shall have an additional faceplate and coupling when used for wide pipe spaces. Provide tiling frame or setting gauge with carriers for wall-hanging water closets.

2. Chair Carriers: Supports with steel pipe uprights for wall-hanging fixtures. Urinal chair carriers shall have bearing plates.

3. Chair Carriers, Heavy Duty: Supports with rectangular steel uprights for wall-hanging fixtures.

4. Reinforcement: 2-inch by 4-inch wood blocking between studs or 1/4-inch by 6-inch steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.

C. Support Types: Provide support of category specified, of type having features required to match fixture.

D. Provide supports specified as part of fixture description, in lieu of category and type requirements above.

2.09 INSULATION KITS

A. Insulation kits for lavatory and sink waste and supplies of vinyl plastic with reusable fasteners and openings for access to supply stop handles.

PART 3 EXECUTION

3.01 APPLICATION

A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.

B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:

1. Carriers for following fixtures:
   a. Wall-hanging water closets.
   b. Wall hanging lavatories
   c. Wall hanging electric water coolers and drinking fountains.
d. Wall-hanging fixtures supported from wall construction.

2. Chair carriers for the following fixtures:
   a. Wall-hanging urinals.
   b. Wall-hanging lavatories and sinks.
   c. Wall-hanging drinking fountains and electric water coolers.

3. Heavy-duty chair carriers for the following fixtures:
   a. Accessible lavatories.
   b. Fixtures where specified.

4. Reinforcement for the following fixtures:
   a. Floor-mounted lavatories required to be secured to wall.
   b. Floor-mounted sinks required to be secured to wall.
   c. Recessed, box-mounted electric water coolers.
   d. Wall mounted and mop sink faucets.
   e. Urinal flush valve solid pipe ring supports.

3.02 INSTALLATION OF PLUMBING FIXTURES

A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing-in drawings, and referenced standards.

B. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.

C. Install floor-mounted, back-outlet water closets with fittings and gasket seals.

D. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gauge.

E. Install wall-hanging, back-outlet urinals with gasket seals.

F. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

G. Fasten floor-mounted fixtures and special fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.
H. Fasten wall-mounted fittings to reinforcement built into walls.
I. Fasten counter-mounting-type plumbing fixtures to casework.
J. Secure supplies behind wall or within wall pipe space, providing rigid installation.
K. Install stop valve in an accessible location in each water supply to each fixture.
L. Install trap on fixture outlet except for fixtures having integral trap.
M. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.
N. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant in accordance with sealing requirements specified in Division 7 Section “Joint Sealers.” Match sealant color to fixture color.
O. Install insulation kits on ADA compliant sink and lavatory waste, continuous wastes, hot and cold water supplies where indicated on the drawings and as required by the ADA.

3.03 CONNECTIONS
A. Piping installation requirements are specified in other sections of Division 22. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

   1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 22.

3.04 FIELD QUALITY CONTROL
A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.05 ADJUSTING AND CLEANING
A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
B. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.
C. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.

D. Replace washers of leaking and dripping faucets and stops.

E. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.

F. Adjust faucet wrist blade handles perpendicular to the spout while in the closed position.

G. Review the data in Operating and Maintenance Manuals. Refer to Division 1 Section "Project Closeout."

H. Set each shower valve temperature limit stop to 110°F. Perform work after the shower head is installed and the domestic water heater is in operation. Allow the hot water to run for 5 minutes minimum or until temperature reaches equilibrium. Allow cold to run for 5 minutes minimum or until temperature reaches equilibrium. Provide the architect a report and schedule indicating the hot, cold and mixed maximum water temperature at each shower.

3.06 FIXTURE SCHEDULE

A. Provide plumbing fixtures as specified on the drawings.

B. Install rough-in for plumbing fixtures as scheduled on the drawings.

3.07 MOUNTING HEIGHTS SCHEDULE:

A. Refer to the architectural drawings for plumbing fixture mounting heights. Unless indicated otherwise, install plumbing fixtures with the mounting heights as listed below with final approval by the Architect:

<table>
<thead>
<tr>
<th>FIXTURE</th>
<th>MOUNTING HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lavatory or Sink</td>
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</tr>
<tr>
<td>Standard Height</td>
<td>31” floor to rim</td>
</tr>
<tr>
<td>ADA Accessible</td>
<td>34” floor to rim</td>
</tr>
<tr>
<td>Urinal</td>
<td></td>
</tr>
<tr>
<td>Standard Height</td>
<td>24” floor to rim</td>
</tr>
<tr>
<td>ADA Accessible</td>
<td>17” floor to rim</td>
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<tr>
<td>Water Closet</td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>15” floor to rim</td>
</tr>
<tr>
<td>ADA Accessible</td>
<td>17” to 19” floor to top of seat</td>
</tr>
<tr>
<td>Water Cooler or Drinking Fountain</td>
<td></td>
</tr>
<tr>
<td>Standard Height</td>
<td>41” floor to spout</td>
</tr>
<tr>
<td>ADA Accessible</td>
<td>36” floor to spout</td>
</tr>
<tr>
<td>Shower Valves</td>
<td></td>
</tr>
<tr>
<td>Standard Height</td>
<td>48” men and 42” women floor to centerline</td>
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<tr>
<td>-----------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>ADA Accessible</td>
<td></td>
</tr>
<tr>
<td>to centerline</td>
<td></td>
</tr>
<tr>
<td>Shower heads</td>
<td></td>
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<tr>
<td>Standard Height</td>
<td></td>
</tr>
<tr>
<td>Ice Maker Outlet Boxes</td>
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<tr>
<td>Washing Machine Outlet Boxes</td>
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<tr>
<td>Janitor’s Sink Faucet Fittings</td>
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<tr>
<td>Hose Bibbs</td>
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</tr>
<tr>
<td>Non Freeze Wall Hydrant</td>
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END OF SECTION