ITB 19-090 EXHIBIT B

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SECTION 01230 ALTERNATES

A.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

A.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

A.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether indicated as part of alternate or not.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

B. PRODUCTS (Not Used)

C. EXECUTION

C.1 SCHEDULE OF ALTERNATES

Base Bid: All work indicated on the bid documents (drawings and specifications).
Deductive Alternate #1 All work related to Shower Area #1
Deductive Alternate #2 All work related to Shower Area #2.

END OF SECTION

SECTION 02870 SITE WORK LANDSCAPE FURNISHINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification section, apply to work of this section.

1.02 SCOPE

Covers trash receptacles and benches complete and installed.

1.03 RELATED WORK

A. Section 03300 - Cast in Place Concrete

1.04 SUBMITTALS

Manufacturers literature identifying and describing items shall be submitted to Architect for approval. Submit samples of color and finish. See section 01300, for Submittal requirements

1.05 ACCEPTABLE MANUFACTURERS A. Bright Idea Shops

B. Landscape Forms

C. Victor Stanley

D. Wausau Select

PART 2 PRODUCTS

2.01 Litter Receptacles: “Model 6095 Jumbo Waste Receptacle (no ashtray) by Bright Idea. Unit is a side open, surface mount receptacle, freestanding, 34”x 34” x 43”, /60-gallon liner. Color: White and Granite. Provide amount shown on drawings.

2.02 Benches: “Model FP2021, Boardwalk Bench, 72” by Bright Idea. Color: White/White. Provide amount shown on drawings.

PART 3 EXECUTION

3.01 Surface mount supports shall be placed plumb and level with fasteners of type and size capable of being used on finished concrete and on pavers over a concrete base. Attach to concrete paving following manufacturers installation instructions. Stainless steel fasteners are required in this location. Consult manufacturer’s recommendations for fasteners.

END OF SECTION

SECTION 03300 CAST-IN-PLACE CONCRETE

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

B. Florida Department of Transportation (FDOT), *FDOT Material's Manual, Chapter 9.2, Volume II, FDOT Standard Specifications for Road and Bridge Construction, Section 346, 347, 350, 400, 522, & 925, Latest Edition.*

1.2 SUMMARY

This Section includes concrete work for the following:

1. Roadways
2. Parking lots
3. Curbs and gutters
4. Walkways
5. Pads
6. Flumes
7. Curb Ramps
8. Cast in Place Structures

1.3 SUBMITTALS

A. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry- shake finish materials, and others if requested by the County.

B. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material certificates in lieu of material laboratory test reports when permitted by the County. Material certificates shall be signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements. Provide certification from admixture manufacturers that chloride content complies with requirements.

1.4 PROJECT CONDITIONS

A. Traffic Control: Comply with requirements of Santa Rosa County and MUTCD.

B. Utilize flagmen, barricades, warning signs and warning lights as required, as shown on plans, or as directed by the County.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Concrete shall conform to requirements of FDOT Standard Specification, Sections 346, 347, & 522 for curbs, gutters, sidewalks, structures and miscellaneous concrete.

B. Concrete for pavement shall conform to requirements of FDOT Standard

Specification, Section 350.

C. Curb Ramps shall conform to FDOT Design Standards Index 304.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 60, deformed.
B. Welded Steel Wire Fabric: ASTM A 185.
1. Furnish in flat sheets, not rolls.

C. Deformed-Steel Welded Wire Fabric: ASTM A 497.

D. Fabricated Bar Mats: Welded or c lip-assembled steel bar mats, A STM A184. Use ASTM A615, Grade 60 steel bars, unless otherwise indicated.

E. Joint Dowel Bars: Plain steel bars, ASTM A615, Grade 60. Cut bars true to length with ends square and free of burrs.

F. Hook Bolts: ASTM A307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

G. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications. Use supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. Portland Cement: Type I, Type IP, Type IS, Type IP (MS), Type II, or Type III.
1. Use one brand of cement throughout Project.

2. All concrete shall develop a 28-day compressive strength of 3000 psi for non -structural (NS). If any concrete should fail to meet the strength requirement the structure shall be removed as necessary to remove the defective concrete and shall then be rebuilt at the Contractor's expense.

B. Fly Ash: ASTM C618, Class C or Class F.

C. Normal-Weight Aggregates: ASTM C33, Class 4, and as follows. Provide aggregates from a single source.

1. Maximum Aggregate Size: 1-1/2 inches.

2. Do not use fine or coarse aggregates that contain substances that cause spalling.

3. Local aggregates not complying with ASTM C33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Engineer.

D. Water: Potable.

E. Fiber Reinforcement: Synthetic fibers engineered and designed for secondary reinforcement of concrete slabs, complying with ASTM C1116, Type III.

2.4 ADMIXTURES

A. Provide concrete admixtures that contain not more than 0. 01 percent chloride ions.

B. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

C. Water-Reducing Admixture: ASTM C494, Type A.

D. High-Range Water-Reducing Admixture: ASTM C494, Type F or Type G.
E. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.
F. Water-Reducing and Retarding Admixture: ASTM C494, Type D.

2.5 CONCRETE MIX

A. Prepare design mixes for each type and strength of normal-weight concrete per FDOT Standard Specification, Section 346-6.2 and FDOT Material's Manual, Chapter 9. 2, Volume II. Use a qualified independent testing laboratory for preparing and reporting proposed mix designs. Do not use the Owner's field quality-control testing laboratory as the independent testing laboratory.

B. Fiber Reinforcement: Add to mix at rate of 1.5 lb per cu. yd., unless manufacturer recommends otherwise.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

2.6 CONCRETE MIXING

Ready-Mixed Concrete: Comply with requirements of FDOT Standard Specification, Section 346-7 and FDOT Material's Manual, Chapter 9.2, Volume II.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION FOR CONCRETE PAVEMENT
A. Proof-roll prepared base or subgrade surface to check for unstable areas and verify

need for additional compaction. Do not begin concrete work until such conditions have been corrected and are ready to receive paving.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install sufficient forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork and screeds for grade and alignment to following tolerances:

1. Top of Forms: Not more than 1/8 inch in 10 ft.
2. Vertical Face on Longitudinal Axis: Not more than ¼ inch in 10 feet

C. Clean forms after each use and coat with form release agent as required ensuring separation from concrete without damage.

3.3 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for " Placing Reinforcing Bars" for placing and supporting reinforcement. Comply with FDOT Standard Specification, Section 350-7.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction. Use of chairs is required. Welded wire fabric shall not be “pulled” to center of slab.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.4 JOINTS

A. General: Construct control (contraction) joints, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.

B. Control (Contraction) Joints: Control joints are grooved, formed, or sawed into sidewalks, driveways and concrete pavements so that cracking will occur in these joints randomly. If not specified on drawings, intervals shall be not greater than 10 feet or less than 5 feet. Construct control joints for a depth equal to at least 1/4 of the concrete thickness, as follows:

1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, spawl or otherwise dam age surface and before development of random contraction cracks.

3. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.

C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than ½ hour, unless paving terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless indicated otherwise. Embed keys at least 1-1/2 inches into concrete.

2. Continue reinforcement across construction joints unless indicated otherwise.

D. Expansion Joints: Form expansion joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 30 feet, unless indicated otherwise or directed by County.

2. Extend joint fillers full width and depth of joint, not less than ½ inch or more than 1 inch below finished surface where joint sealant i s indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.

3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.

4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

E. Filler and Sealants: Submit specifications to Engineer for approval.

F. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.

3.5 CONCRETE PLACEMENT

A. Comply with requirements of FDOT Standard Specification, Sections 350-8 and 400-7 for placing concrete.

B. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into pl ace. No concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. Deposit concrete as nearly as practical to its final location to avoid segregation. When

concrete placing is interrupted for more than ½ hour, place a construction joint.

C. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

D. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, floating, or tamping. Use equipment and procedures to consolidate concrete complying with FDOT Standard Specification, Section 350-9.

E. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

F. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to County.

G. Curbs and Gutters: Shall be constructed in accordance with FDOT Specs. When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.

H. Slip-Form Pavers: When automatic machine placement is used for paving, submit revised mix design and laboratory test results that meet or exceed requirements. Produce paving to required thickness, lines, grades, finish, and jointing as required for formed paving. Compact subgrade of sufficient width to prevent displacement of paver machine during operations.

I. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength, or sufficient strength to carry loads without damage or injury. Maturity Method Testing, as outlined in FDOT Standard Specification, Section 353-10.2, should be used to determine concrete strength.

J. Cold-Weather Placement: Comply with provisions of FDOT Standard Specification, Sections 346-7.4 and 400-7.1.1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

K. Hot-Weather Placement: P lace concrete complying with FDOT Standard Specification, Sections 346-7.5 and 400-7.1.2, and as specified when hot weather conditions exist.

3.6 CONCRETE FINISHING

A. Float Finish: Begin floating when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand -floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/8 inch in 10 feet as determined by a 10-foot-long straight- edge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.

2. Tine Finishes: Apply to curb cut ramps and other areas as noted on the drawings. Finish shall be applied by an approved hand method and shall consist of transverse grooves which are 0.03 to 0.12 inch in width and 0.10 to 0.15 inch in depth, spaced at approximately ½ inch center to center.

B. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces. Radius: ½ inch.

3.7 CONCRETE PROTECTION AND CURING

General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of FDOT Standard Specification, Sections 350-11 and 925.

3.8 QUALITY CONTROL TESTING

A. A qualified, accredited testing and inspection laboratory, under the direction of a Professional Engineer, licensed in the State of Florida, shall sample materials, perform tests, and submit test reports during concrete placement as follows:
1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with A STM C94. All concrete should be sampled by ACI certified technicians.

a. Slump: ASTM C143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.

b. Air Content: ASTM C231, pressure method; one test for each compressive-strength test but no less than one test for each day's pour of each type of air-entrained concrete.

c. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F (4 deg C) and below and when
80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.

d. Compression Test Specimens: ASTM C31; one set of four standard cylinders for each compressive- strength test, unless directed otherwise. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.

e. Compressive-Strength Tests: ASTM C39; one set for each day's pour of each concrete class, plus one set for each additional 50 cu. y d. Test one specimen at 7 days, two specimens at 28 days, and retain one specimen in reserve for earlier or later testing if required. Class I Concrete NS compression test specimens cylinders are not required, except as directed by County.

f. Contractor shall repair the area to the satisfaction of the Engineer where material was removed for testing purposes. Should any work or materials fail to meet the requirements set forth in the plans and specifications, contractor shall pay for retesting of same.

2. Basis for acceptance of concrete will be per FDOT Standard Specification, Sections 346-8 through 346-11.

B. Test results will be reported in writing to the County, within 24 hours of testing. Reports of compressive strength tests shall contain the Project identification name and number, date and location of concrete placement, name of concrete testing laboratory, concrete type and class, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28- day tests.

C. Nondestructive Testing: Non-destructive test methods may be used with approval of the Engineer, but shall not be used as the sole basis for acceptance or rejection.

D. Additional Tests: The testing laboratory will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer. Testing laboratory may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.9 REPAIRS AND PROTECTION

A. Remove and replace concrete work that is broken, damaged, or defective, or does not meet the requirements of this Section.

B. Drill test cores where directed by the County when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory concrete areas with Portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from concrete pavement for at least 14 days after placement. When construction traffic is permitted, maintain concrete as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete work free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

PART 4 - MEASUREMENT/PAYMENT

4.1 METHOD OF MEASUREMENT

The quantities to be paid for will be the plan quantity, in square yards, of Plain Cement Concrete Pavement, Reinforced Cement Concrete Pavement, square yards of sidewalk, and linear feet of curb and/or gutter.

4.2 JOINTS AND CRACKS

The Contractor shall include the cost for Cleaning and Sealing Joints in the cost of the newly constructed pavement for: (1) transverse and longitudinal joint construction for new pavement; and (2) abutting joints between existing pavement and new pavement.

For replacing joint seals and sealing random cracks in existing Portland cement concrete pavement, the quantity to be paid for will be as specified below:
A. The length of pavement joint that has been satisfactorily cleaned and sealed in existing

Portland cement concrete pavement, as determined by field measurement along the joints, will be paid for at the Contract unit price per foot for Cleaning and Resealing Joints.

B. The length of random cracks in existing Portland cement concrete pavement that have been satisfactorily cut, cleaned, and sealed, as determined by field measurement along the joints, will be paid for at the Contract unit price per foot for Cleaning and Sealing Random Cracks.

4.3 BASIS OF PAYMENT

Prices and payment will be full compensation for all work specified in this Section, including any preparation of the subgrade not included in the work to be paid for under another Contract item; all transverse and longitudinal joint construction, including tie-bars and dowel bars; the furnishing of test specimens; repair of core holes; and all incidentals necessary to complete the work.

END OF SECTION 03300

SECTION:03353 STAMPED CONCRETE

PART 1 GENERAL
1.1
SECTION INCLUDES Stamped concrete.

1.2
RELATED SECTIONS
Section 03 30 00 - Cast-in-Place Concrete.

1.3
REFERENCES
A. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

B. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete.

1.4
SUBMITTALS
A. Submit under provisions of Section 013000 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1.Preparation instructions and recommendations.
2.Storage and handling requirements and recommendations.
3.Installation methods.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples, minimum size 12 inches square representing actual product, color, and patterns.

E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

F. Applicator's Project References: Submit applicator's list of successfully completed stamped concrete projects, including project name and location, name of architect, and type and quantity of materials applied.

1.5
QUALITY ASSURANCE
A. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products. B. Installer Qualifications: Minimum 2-year experience installing similar products.
1.Regularly engaged, for preceding 5 years, in application of stamped concrete of similar type to that specified.
2.Employ persons trained for application of stamped concrete.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1.Construct Mock-ups of Stamped Concrete:
a. Use same materials and methods for use in the Work.

b. Location: Determined by Architect.
c. Minimum Size: 4 feet by 4 feet.

2. Receive approval of mock-ups by Architect for patterns, colors, textures, finishing, curing, cleaning, sealing, special effects, and workmanship before application of stamped concrete.
3. Approved Mock-ups:
a. Standard for patterns, colors, textures, finishing, curing, sealing, special effects, and workmanship of stamped concrete.
b. Retain through completion of Work for use as quality standard.

1.6
PRE-INSTALLATION MEETINGS
A. Convene minimum two weeks prior to starting work of this section.
1. Require attendance of parties directly affecting work of this section, including:
a. Contractor.
b. Architect.
c. Applicator.

2. Review
a. Mock-ups.
b. Materials.
c. Preparation.
d. Application.
e. Finishing.
f. Curing.
g. Cleaning.
h. Sealing.
i. Protection.
j. Coordination with other work.

1.7
DELIVERY, STORAGE, AND HANDLING
A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:
1. Store and handle materials in accordance with manufacturer's instructions.
2. Keep materials in manufacturer's original, unopened containers and packaging until application.
3. Store materials in clean, dry area indoors.
4. Store materials out of direct sunlight.
5. Keep materials from freezing.
6. Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS
A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Apply materials when air and surface temperatures are between 55 degrees F (13 degrees C) and 80 degrees F (27 degrees C).

C. Do not apply materials when rain, snow, or excessive moisture is expected during application or within 24 hours after application.

1.9 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturer: Solomon Colors, which is located at: 4050 Color Plant Rd.; Springfield, IL 62702-1060; Toll Free Tel: 800-624-0261; Tel: 217-522-3112; Fax: 800-624-3147; Email: request info (sgs@solomoncolors.com); Web: www.solomoncolors.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Ready Mix Integral Color.
1. Compliance: ASTM C 979.
2. Color: To be selected by Architect from Integral color palette
3. Color hardener (topical)

B. Stamping Mats Pattern: Sidewalk Stone Texture

C. Curing Compound:
1. Clear, non-yellowing, non-staining, breathable, UV stable.
2. Compliance: ASTM C 309.
3. Compatible with colored concrete.

C. Concrete Cleaner: "Antique Release/Efflorescence Remover".
1. Biodegradable.

PART 3 EXECUTION
3.1
EXAMINATION
A. Examine surfaces to receive stamped concrete.
B. Notify Architect of conditions that would adversely affect application or subsequent use.
C. Do not begin preparation or application until unacceptable conditions are corrected.

3.2
PREPARATION
A. Protection of In-Place Conditions: Protect adjacent surfaces, areas, adjoining walls, and landscaping from contact with stamped concrete materials.
B. Preparation of Subgrade:
1. Ensure subgrade is uniformly graded, compacted, and moistened.
2.Ensure subgrade is free of standing water.
3.Do not place concrete over soft, frozen, or muddy subgrade.

C. Concrete:
1.Specified in Section 03 30 00 - Cast-in-Place Concrete, unless otherwise specified in this section.

3.3
APPLICATION

A. Apply stamped concrete materials in accordance with manufacturer's instructions at locations indicated on the Drawings.

B. Concrete Topping and Hardener:
1.Apply concrete topping and hardener in accordance with manufacturer's instructions.
2.Apply concrete topping and hardener to give complete and uniform coverage to concrete.
3.Ensure uniform color results.

C. Integrally Colored Concrete: Design mix, batch, add colorant, place, finish, and cure concrete in accordance with integral concrete color manufacturer's instructions.

D. Colorless Bond Breaker:
1.Apply colorless bond breaker in accordance with manufacturer's instructions to bottom of stamping mats and on concrete surface, when concrete has reached plastic stage desirable for imprinting.
2.Do not trowel or mix colorless bond breaker into plastic concrete surface.

E. Stamping Mats:
1.Press stamping mats in accordance with manufacturer's instructions into concrete that has reached plastic stage desirable for imprinting.
2.Use stamping mats to create patterns in concrete as indicated on the Drawings.

F. Approved Mock-ups: Match approved mock-ups for patterns, colors, textures, finishing, curing, cleaning, sealing, special effects, and workmanship.

3.4
CURING

A. Cure concrete in accordance with manufacturer's instructions.

B. Apply curing compound in accordance with manufacturer's instructions.

C. Do not cure concrete using materials or methods harmful to concrete surface, including:
1.Low-pressure or high-pressure steam.
2.Burlap.
3.Plastic sheeting.
4.Membrane paper.
5.Water misting.
6.Sodium-silicone-type hardeners.

3.5
CLEANING

A. Clean concrete in accordance with manufacturer's instructions.
B. Apply concrete cleaner in accordance with manufacturer's instructions to remove:
1.Excess colored bond breaker/antiquing release agent.

2.Efflorescence.
3.Cement scale.

C. Apply concrete cleaner before sealing concrete surface.

3.6
PROTECTION
A. Exterior Surfaces: Protect applied stamped concrete to ensure that, except for normal weathering, concrete will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION: 06100 CARPENTRY

PART 1: GENERAL

1.01 RELATED DOCUMENTS:
Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 SCOPE:
Includes carpentry work and material necessary for a complete installation.

1.03 RELATED WORK:
1. Light Steel Framing
2. Roof and Coping Framing
3. Roofing

1.04 STANDARDS:
Each piece of lumber and plywood shall have a grade mark of an agency certified by the board of review of the American Lumber Standards Committee.

1.05 SUBMITTALS:
Provide (7) seven copies of manufacturers shop drawings and installation instructions.

PART 2: MATERIALS

2.01 Framing and blocking shall be #2 dense SYP of sizes and dimensions shown. Members used on the exterior and in contact with concrete or masonry shall be pressure treated wolmanized.

2.02 Plywood shall be 3/4" and ½" CDX, pressure treated in lower exterior walls. Roofing sheathing shall be 5/8" CDX.

2.03 Redwood shall be clear heart material, of sizes and dimensions shown.

2.04 Cement board material is specified under hard tile section, 09300.

2.05 Synthetic Siding is 7 ¼" x 5/16" Cedar Mill lap siding with 6" exposure and Cedar Mill vertical sheet panel by James Hardie Building Products.

2.06 Corner and edge trim is to be Hardi Trim by James Hardie Building Products in widths and thicknesses shown.

PART 3: INSTALLATION

3.01 Blocking and grounds shall be installed in a manner to eliminate cupping and warping. Members over 4" nominal width shall be kurfed on down side. Blocking shall be bolted to sub structure or otherwise securely attached to prevent movement. Nails will be double galvanized common nails of appropriate size (or galvanized screw nails). Provide solid blocking in framed partitions for support of door stops, other hardware items mounted to the walls and for light switches, electrical outlets and devices and recessed speakers. Provide 2x blocking in walls for base and upper cabinets.

3.02 Apply synthetic lap siding and trim over water resistive barrier (specified in Section 07100) over ¾" plywood attached to wood stud framing. Blind nail attach using stainless steel screws, No. 8-18 x.323" HD x 1 5/8" long. Stainless steel screws must penetrate 1/2" into material siding is to be attached to. Screw heads must be flush with the plank face and NOT countersunk. The first course of any wall should be installed over a 1/4" lath strip to ensure a consistent plank angle. Install Hardiplank siding in compliance with local building codes for clearance between the bottom edge of plank and the finished grade. Butt ends of planks to trim. Caulk all joints with caulking (specified in Section 07100).

END OF SECTION

SECTION: 06400 ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Provide shop-fabricated exposed woodwork and casework:
   1. Plastic laminate millwork.
   2. Plastic laminate countertops.
   3. Solid surface tops

1.02 SUBMITTALS

A. Submit for approval samples, shop drawings, product data

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Quality standard for fabrication and products: Architectural Woodwork Institute Quality Standards, Premium grade unless noted otherwise.

B. Plastic laminate: NEMA LD-3, glued-on melamine paper is not allowed.

C. Base cabinets and wall cabinets:
   1. Construction: Reveal overlay, Grade M-2 medium-density particleboard substrate, sink cabinet bodies shall have moisture resistant plywood substrate, wall cabinets shall have a clear inside depth of 12 inches, drawer boxes shall be of wood construction, drawers shall have separate front panel attached to drawer box, no staples allowed.
   2. Exposed surfaces: High-pressure decorative laminate as follows:
      a) Horizontal surfaces other than tops: GP-50.
      b) Vertical surfaces: GP-28.
      c) Body edges: 0.5 mm PVC, color matched.
      d) Door/drawer edges: 3 mm PVC tape, machine applied.
   3. Semi-exposed surfaces:
      a) Surfaces other than drawer bodies: High-pressure decorative laminate, Grade CL-20.
      b) Drawer sides and backs: Thermoset decorative overlay.
      c) Drawer bottoms: Thermoset decorative overlay.
   4. Countertops: countertops shall be built in lengths that will facilitate ease of replacement.
      a) Core: Plywood, provide with backer sheet for balanced construction, water-resistant plywood shall be used where a sink is installed.
      b) Laminate: GP-50.
      c) Edge: 1-1/2” self-edge, 3-mm PVC, machine applied.

d) Backsplash: ¾” x 4”, butted to countertop.

5. Adjustable shelving: 32 mm in-line boring with double-pin reinforced plastic shelf supports.
   a) Edge: 0.5 mm PVC, color matched, all four edges.

D. Hardware: Steel or brass with satin-chromium plate finish. Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard

1. Drawer slides: BHMA B05091; zinc-plated, ball bearing side-mount full- extension, minimum 75-lbf rating, provide 150-lbf rating at file drawers.
2. Hinges: BHMA B01521; 2-3/4” x .095” semi-concealed, 5-knuckle.
3. Catches: BHMA B03091; metal single-roller catch, magnetic catches are not allowed. Provide Heavy Duty roller catches only.
4. Pulls: BHMA B02011; 4” back-mounted steel or brass wire pulls.
5. Locks: BHMA E07261; cam lock, key removable in locked and unlocked positions, all locks shall be keyed alike.

E. Solid surfacing is Corian by DuPont or equal.
Plastic laminate shall be high pressure laminate by Wilsonart, or Formica

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with AWI quality standards and mark each piece with manufacturer's identification and AWI quality grade. Comply with details shown for profile and construction features.

1. Casework: AWI premium grade, laminate covered reveal overlay construction, institutional hardware quality level.
2. Countertops: AWI premium grade, butted backsplash and self-edge at front lip.

B. Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Install work plumb, level, true and straight, scribe to fit. Anchor securely with concealed fasteners.

D. Repair or replace damaged work, clean, lubricate and adjust hardware; protect work until final acceptance.

END OF SECTION

SECTION 07100 WATERPROOFING & SEALANTS

THERMAL & MOISTURE PROTECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

The General Provision of the Contract, including bidding conditions and contractual conditions apply to the work specified in this section.

1.02 SCOPE

This section includes water-proofing, sealants, caulking and related items.

1.03 RELATED WORK

A. Cast in Place

C. Windows and Doors

D. Carpentry

PART 2 MATERIALS

2.01 ADHESIVES: Shall be Nerva-Plast by Rubber and Plastic Compound Company and Bituthane 3000 by W.R. Grace or equal.

2.03 CAULKING

A. One part caulk shall be VLM 150 by BASF.

2.04 BACKER ROD: Shall be polyethylene rod.

2.05 AIR/MOISTURE INFILTRATION BARRIER: Typar type housewrap behind synthetic siding.

2.06 UNDER STANDING SEAM METAL ROOFING: See section 074113

PART 3 INSTALLATION

3.02 CAULKING: Apply one-part caulk around perimeter of windows and outside door frames and as indicated in masonry recesses. Flow on smoothly for even surface. Color will be selected by the architect from manufacturers standard color palette. Use backer rod to achieve two points of contact between materials. Review minimum sealant joint width at window/door perimeters of 3/8".

END OF SECTION

SECTION 07413 PRE-FORMED STANDING SEAM METAL ROOF
THERMAL AND MOISTURE PROTECTION

1. PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

1. This Section covers the , pre-finished, pre-fabricated Architectural standing seam roof system. All metal trim, accessories, fasteners, insulation, and sealants indicated on the drawings as part of this section.

2. Related Work Specified Elsewhere:

1. Refer to all sections in Division 0, CONTRACT REQUIREMENTS, and Division 1, GENERAL REQUIREMENTS.

1.2 QUALITY ASSURANCE

1. **Petersen Aluminum Corporation, Acworth, GA 800-272-4482** products establish a minimum of quality required.

2. Manufacturer and erector shall demonstrate experience, of a minimum of ten (10) years in this type of project.

1.3 SUBSTITUTIONS

1. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.

1.4 ROOF SYSTEM PERFORMANCE TESTING

1. Water Penetration: When tested per ASTM E-283/1680 and ASTM E-331/1646 there shall be no uncontrolled water penetration or air infiltration through the panel joints.

2. Roof System shall be designed to meet Florida Building Code wind load requirements for the specific project location. The panel shall have been tested to ASTM E-1592. Requirements and shall have a Negative Load Table in the required FBC format with a 2.0 Factor of Safety shown in this Negative Load Table.

3. Roof System shall be designed to meet a UL Class 90 wind uplift in accordance with UL standard 580 and panel system shall be ASTM 1592 Tested and approved: U. S Army Corps of Engineer requirement. Roof system shall have current FLORIDA BUILDING CODE PRODUCT APPROVAL and shall be supported by ASCE 7 “stamped/sealed” Florida Independent Engineer Calculations from the Roofing System Manufacturer to support the applicable Zone 1, Zone 2 and Zone 3 loads for this particular project. Extrapolations will not be allowed in these calculations, only interpolations by the Engineer to illustrate the clip layout for each Zone listed above.

1.5 WARRANTIES

1. The Manufacturer shall warrant for twenty years (20) from the date of substantial completion of the Work related to this section, that the work is not defective in workmanship or material, and that the roof will be adequate to prevent leaks. This warranty may be provided in the short term by the Contractor/Roof Installer, however must have the backing and assurance of the roof system manufacturer.
2. Finish Warranty on Aluminum: (**Coastal Application)**
Written 20 Year Finish Warranty shall be required for the Aluminum Standing Seam Roof System including Flashings, and related rain-carrying equipment as supplied by the manufacturer and roofing contractor. This warranty will be for 20 Years and cover: Chalking, Fading and Integrity of the Kynar 500™ paint finish on the Aluminum. Note this is a Coastal Application with exposure to the ocean and Salt Spray. This 20 Year Finish Warranty shall cover this type of Coastal Application and must be signed and executed by the Roofing System manufacturer.

1.6 SUBMITTALS

1. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and type of sealants, and any other details as may be required for a weather-tight installation.

2. Provide finish samples of all colors specified.

2. PART 2 - PRODUCTS

2.1 PANEL DESIGN

1. Roof panels shall be standing seam in 18" widths with 2” high seam, mechanically-seamed panels with Factory-supplied & calibrated Mechanical Seamers that form the completed seam to an 180* seamed panel.
2. Gage specified herein is minimum .032” Aluminum Gage Thickness. (040” gage for detached shed (Rooms 158 and 159))
3. Panels shall be factory manufactured either “with Striations” or “with pencil ribs and with striations” at the selection of the Architect.

2.2 ACCEPTABLE MANUFACTURERS

1. This project is detailed around the roofing product of Petersen Aluminum Corporation, Kennesaw, GA "**TITE-LOC PLUS" PANEL,**
Similar products of the following manufacturers will be considered equal**:**
IMETCO, Tucker, GA,
MERCHANT & EVANS, Burlington, NJ.
ATAS International, Inc.

2. **Color shall be: "PAC-CLAD" Kynar 500™ color: Silver.**

2.3 MATERIAL AND FINISHES

1. Face Sheet Material: Aluminum Standing Seam Sheet shall be produced from ASTM B-209 quality Aluminum, 3105 H-14 Alloy and Temper material.

Aluminum shall be tension leveled (temper passed and stretcher leveled) with camber a maximum

of 1/4 inch in 20 feet, manufactured in the USA, and be
.032" Thick Aluminum U.S. standard gauge. ***Standards and shall meet applicable Florida Building Code Wind load requirements for this project location. Additionally, Florida Professional Engineer Stamped Calculations will be required for the project to certify the roof panel assembly meets the applicable Building Code wind loads per ASCE 7 standards.***

2. FINISH

1. Finish:
    1. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over 0.25 to 0.31 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to al tests for adhesion, flexibility, and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.

    2. If Strippable coating shall be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and field handling. This strippable coating shall be removed before installation.
    3. Field protection must be provided by the Contractor at the jot site so material is not exposed to weather and moisture.
2. Exposed Flashing and Trim:
    1. Unless otherwise specified, all exposed adjacent flashing and trim shall be of the same material and finish as panel system.

3. Forming: Use continuous end rolling method. No end laps on panels.
The manufacturer may elect to roll panels on the job site due to panel lengths that exceed normal transportation limitations of the trucking industry.
4. Trim: Trim shall be fabricated of the same material and finish to match the profiled sheeting and press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer or their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
5. Closures: Use composition or metal profiled closures at the top of each elevation to close ends of the panels. Metal closures to be made of the same material and finish as face sheet.
6. Panel Clips: Shall be Stainless Steel as required by the panel manufacturer
in appropriate Gage and ***spacing of Clips to meet the job-specific Wind Load requirements by the Florida Building Code. Necessary engineering documentation of this clip spacing and attachment to be provided in the submittal stage to the Architect.***
7. Fasteners: Fasteners shall be 400 series stainless steel, dished washers stainless steel with bonded neoprene.
8. Zees: Where required by design of primary structural framing system shall be used to span between beams and/or joists. Thermally responsive base and top clips shall be fastened to the zees on 12" centers.
9. Insulation: See Section 07210: Building Insulation.

2.4 ROOFING UNDERLAYMENT

1. On all surfaces to be covered with roofing material, furnish and install a
40 Mil "Peel & Stick Membrane" will be required as outlined by the metal panel manufacturer**.**
Membrane to be minimum of 40 MIL Thickness, smooth, non-granular, one of the following manufacturers:

a) W.R. Grace “Ice & Water Shield”(High Temperature).
b) Carlisle: CCW WIP 300HT.
c) Interwrap: Titanium PSU.
d) MFM Corp : ‘’Wind & Water Shield’’.
e) MID-STATES Asphalt: Quick Stick HT
f) Polyguard: Polyglas HT.
g) TAMKO: TW Tile & Metal Underlayment.

2. Underlayment shall be laid in horizontal layers with joints lapped toward the eaves a minimum of 6", and well secured along laps and at ends as necessary to properly hold the felt in place. All underlayment shall be preserved unbroken and whole.

2.5 SEALANTS

1. Exterior grade silicone sealant recommended by roofing manufacturer.

2.6 FABRICATION

1. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown and, if not shown, provide manufacturer's standard product fabrication.

2. Fabricate components of the system in the factory, ready for field assembly.

3. Fabricate components and assemble units to comply with fire and performance requirements specified.

4. Apply specified finishes in conformance with manufacturer's standards, and according to manufacturer's instructions.

3. PART 3 - EXECUTION

3.1 INSPECTION

1. Examine alignment of structural steel and related supports prior to installation and do not proceed until the defects are corrected by the responsible contractor.

3.2 FASTENERS

1. Secure units to supports.

2. Place fasteners as indicated in manufacturer's standards.

3.3 INSTALLATION

1. Panels shall be installed plumb and true in proper alignment and relation to the structural framing. The erector must have at least five years successful experience with similar applications.

2. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.

3. Remove all strippable coating and provide a dry wipe-down cleaning of the panels as they

are erected.

3.4 DAMAGED MATERIAL

1. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

SECTION: 07620 FLASHING & SHEET METAL
THERMAL AND MOISTURE PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Provide flashing and sheet metal components for building construction.

1. Copings.
2. Conductor heads and downspouts.
3. Exposed metal trim units.
4. Miscellaneous sheet metal accessories.

1.02 PERFORMANCE REQUIREMENTS

A. System Design: Provide flashing and sheet metal components that are identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7-98.

1. Design wind velocity shall be as shown on structural Drawings.
2. Design pressures are indicated on structural Drawings.

1.03 SUBMITTALS

A. Submit for approval samples, shop drawings, product data.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that flashing and sheet metal components comply with requirements specified in "Performance Requirements" Article.

1.04 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Copings and other roof flashing, rafter end covers, etc.: Minimum .032” (unless otherwise noted on drawings) formed aluminum with hold-down clips and splice plates

B. Conductor heads, downspouts, and gutters: Minimum .040” pre-finished formed aluminum with welded seams, support straps and brackets as required. Support straps for downspouts shall go over the downspouts and be anchored to the wall.

C. Finish: Kynar 500 2-coat fluoropolymer to match metal roofing and soffit panels.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Follow recommendations of SMACNA "Sheet Metal Manual." Allow for expansion. Isolate dissimilar materials to prevent galvanic corrosion.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with a uniform appearance. Coordinate installation with roofing system and work of other sections to ensure weathertight performance. Anchor securely to structure to withstand inward and outward loads.

C. Restore damaged components and finishes. Clean and protect work from damage.

SECTION: 07800 SHADE SYSTEM
THERMAL AND MOISTURE PROTECTION

Part 1 – General

1.1 Related Documents

2 Drawings and general provisions of the Contract, including General Conditions and Division 1 Specifications Sections, apply to this section.

2.1 Summary
The shade structure contractor shall be responsible for design, engineering, fabrication and supply of the work specified herein. The intent of this specification is to have one manufacturer be responsible for the aforementioned functions.

1.3 Submittals

1.3.1 Pre-Bid Submittals

A. Provide proof of installed reference sites with structures for similar scope of project and installation that are engineered to International Building Code (IBC) specifications. Include in reference list of structure dimensions
with install dates and project locations.

B. Provide proof of all quality assurance items including:

1. A list of at least three (3) reference projects that have been installed a minimum of five (5) years.

2. Proof of Liability and Umbrella Insurance.

1.3.2 Award of Contract Submittals

A. Provide structural shop drawings.

B. Provide fabric color and powder coat color selections for final order.
1.4 Project Conditions

A. Field Measurements: verify layout information for shade structures shown on the drawings in relation to the property survey and existing structures. Verify locations by field measurements prior to construction.

1.5 Warranty

A. The successful bidder shall provide a one (1) year warranty on all labor and materials.

B. A supplemental non-prorated warranty from the manufacturer shall be provided for a period of ten (10) years on fabric including stitching and twenty (20) years on the structural integrity of the steel, from date of substantial completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under the provisions of the Contract Documents, and will be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contractor documents.

D. Because of surety requirements, any performance and payment bond that might be required will cover only the first year of the warranty. The manufacturer's warranty will be a separate document and will be executed at the time of completion of the work.

Part 2 – Products

2.1 Manufacturers

The Basis of design is the Shade Systems "Sails" system (4150 SW 19th Street Ocala, FL 34474 (800) 609-6066). Similar and equal products by We Can Shade it or other manufacturer who meet the requirements of this specification and are submitted in accordance with Specification Section 01300 will be considered as equals.

2.2 General

The shade products shall be designed and manufactured to the most exacting specifications by skilled craftsmen and certified by Florida Licensed Professional Engineers for structural soundness of designs. All shade products are shipped knocked-down, with complete assembly instructions, and ready for easy in-field installation. Bidder's products must be completely manufactured entirely in its own factory by its own employees, including powder-coating, thereby ensuring complete quality control. Bidder must certify that no aspect of its production – including powder-coating – is contracted out to third parties.

The proposed structure(s) shall be modular and pre-fabricated, and include the structural steel frame, fabric roof, steel cables and all fasteners.

A. Structures are engineered to meet or exceed the requirements of International Building Code (IBC), and the following standard specifications:

Wind Speed (Frame only): 165 M.P.H.
Wind Speed (Frame w/canopy): 90 M.P.H.
Live Load: None
Snow Load: None

B. Material: All materials shall be structurally sound and appropriate for safe use. Product durability shall be ensured using corrosion-resistant metals such as stainless steel, and coatings such as zinc-plating, galvanizing, and power-coating on steel parts, subject to the Product-Specific requirements. Fabrics used shall include UV-stabilizers and fire retardants for longevity and safety.

C. Weldments: All tubing members are factory-welded by Certified Welders to American Welding Society (AWS) specifications and to the highest standards of quality workmanship. Weldments are finished with a zinc-rich galvanized coating. No field welding is required in the assembly of the shade products.

D. Posts, Structural Frame Tubing, and Hardware: All tubing used shall be cold-formed and milled per ASTM A-135 and ASTM A-500. Material testing is in accordance with

ASTM E-8. Minimum yield is 40,000 psi with a minimum tensile strength of 45,000 psi on all posts. Support pipes shall be schedule 40 black steel with appropriate pre-treatment (PRIMER) for powder-coating. All fastening hardware shall be stainless steel.

E. Polyester Powder-coating Process: All powder-coated parts are completely cleaned and a hot zinc phosphate pretreatment with non-chromic sealer is applied. Powder-coating is then electrostatically applied and oven-cured at 375 to 425 degrees Fahrenheit. Polyester powders shall meet or exceed ASTM standards for Adhesion, Hardness, Impact, Flexibility, Overbake Resistance, and Salt Spray Resistance. Colors shall be specified.

F. Standard Footings: Footings shall be designed per stringent International Building Code (IBC) for the specified structure. Columns will be provided as standard direct embedment. Other footing designs are available.

G. Roofing: Sails are designed for use with polyethylene shade fabric. Fabric is attached to posts using the Fastening Systems below in conjunction with minimum ¼" diameter stainless steel cables. Cable fasteners are to be 316 stainless steel.

2.2 Fastening System

CoolNetTM Shade Fabric shall be delivered complete with fastening system installed. Fastening System to consist of factory-formed stainless-steel tensioning plates pre- attached to fabric canopies at each corner, and cables per the above hemmed into the fabric at the factory and terminating in the bracket. Posts shall be equipped with an adjustable 360-degree swivel and pivot attachment mechanism to which the tensioning plate fastens. Tensioning plate includes a stainless-steel adjustment bolt which, when turned, tensions the fabric for a taut fit. Fabrics, cables, and brackets which are not pre- assembled at the factory are not acceptable. Cables may also be attached to the posts using a stainless-steel turnbuckle system.

2.3 Fabric

A. Shade Fabric: Knitted of monofilament and tape construction high density polyethylene with Ultra-Violent (U.V.) stabilizers and flame retardant. UV- Block Factor varies by standard color offered from 91% to 99%.

Normal Thickness: 0.057 inches

Fabric Mass: Min 340 g/m²

Light Fastness:	7-8 (Blue Wool Scale)
Weather Fastness:	4-5 (Grey Scale Test)
Tear Resistance:	Warp 210N
	Weft 276N
Breaking Force:	Warp 786N
	Weft 2494N
Bursting Pressure:	Mean 3500kPa
Bursting Force:	Mean 2146N

All hems and seams are double row lock stitched using exterior grade UV-stabilized polyethylene GORE™ TENARA™ sewing thread (GORE and TENARA

are trademarks of W.L. Gore & Associates).

B. Flammability: Shade Fabric is to be treated with fire retardants and passes requirements established under the NFPA 701 Test Method 2 test standards for flammability, including the accelerated water leaching protocol.

Part 3 – Execution

3.1 Installation

Installations of shade structure(s) shall be performed by an installer who shall follow the manufacturer's instructions for assembly, installation, and erection, per approved drawings.

A. Concrete

1. Concrete work shall be executed in accordance with the latest edition of the American Concrete Building Code, ACI 318.

2. All reinforcement shall confirm to ASTM A-615, Grade 60.

3. Reinforcing steel shall be detailed, fabricated, and placed in accordance with the latest ACI Detailing Manual, and Manual of Standard Practice.

B. Structure is to be true and plumb. According to manufacturer's shop drawings.

C. Any scratches or dents in the structure due to shipping, storage or handling shall be re-powder coated. Field touch up is not permitted.

D. Upon determination of responsibility, repair or replace damaged materials to the satisfaction of the Architect and Owner.

E. On site instructions on maintenance, removal and re-installation of sails to the Owner's Maintenance staff is a requirement of this project.

END OF SECTION

SECTION: 07810 SKYLIGHTS
THERMAL & MOISTURE PROTECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

Drawings and General Provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 SCOPE:

This section covers manufactured skylights and their installation.

1.03 RELATED WORK:
A. Roofing
B. Carpentry
C. Light Steel Framing
D. Drywall Work

1.04 SUBMITTALS:

Shop drawings showing installation details shall be submitted to the Architect for approval.

PART 2 MATERIALS

2.01 Skylights shall be equal to Naturalite Model HRADD -4.71D (self fleshing) hurricane resistant by Vista Wall, a Thermalized Polycarbonate Skylite. Units shall be factory assembled of (2) two sealed pyramid dome. The outer dome and inner domes shall be framed clear acrylic. Provide a thermal break. Skylights are sealed with neoprene gaskets and isobotylene/isoprene between dome and frame, no weeps. Curb are double wall aluminum insulated with polyisocyanurate.

PART 3 INSTALLATION

3.01 Installation shall be in accordance with manufacturer's direction and details of the contract, securely anchored to sub structure and decking. Installation shall be watertight.

END OF SECTION

SECTION: 08200 FIBERGLASS DOORS & FRAMES

DOORS AND WINDOWS

PART 1 GENERAL

1.01 DESCRIPTION

A. Work Includes: Fiberglass reinforced plastic doors and frames. B. Related Work:

- General Conditions, Supplementary Conditions and Division 1 Sections apply to this work.
- Section 04200 - Unit Masonry
- Section 08110 - Hollow Metal
- Section 08710 - Finish Hardware
- Section 08800 - Glass and Glazing

1.02 SUBMITTALS

- Submit shop drawings and product data under provisions of Section 01300.
- Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement and finish.
- Indicate door elevations and internal reinforcement.
- Submit manufacturer's product literature, fabrication descriptions and installation instructions under provisions of Section 01300.

1.03 DELIVERY, STORAGE AND PROTECTION

- Deliver, handle and store doors and frames at the job site in such a manner as to prevent damage. Doors shall not be received before the building is enclosed. Only remove cartons upon arrival of doors at job site if cartons are wet or damaged. Doors shall be stored out of weather and/or extreme temperatures. The doors shall be stored in a vertical position on blocking, clear of the floor and with blocking between the doors to permit air circulation between the doors. All damaged or otherwise
unsuitable doors and frames, when so ascertained, shall be immediately removed from the job site.

1.04 REGULATORY REQUIREMENTS

- Doors to be approved by Florida Building Code (for wind load)
- Fire-rated door and panel construction conforms to products tested under ASTM E152, UL10C & NFPA 252.
- Install door and panel assembly conforming to NFPA 80 for fire-rated class, ANSI A117.1 specification for handicap accessibility, ADA requirements, ANSI A151.1
Mod. swing cycle test in excess of 1,000,000 cycles.

- Flame Spread: All FRP component parts, including the gelcoat finish, shall have a flame spread classification of 25 or less per ASTM E84 and shall be self extinguishing per ASTM D635 unless operating conditions dictate otherwise.

- Resins: Resins to meet with USDA and FDA standards for incidental food contact, if applicable to this project.

PART 2 - PRODUCTS
2.01 ACCEPTABLE MANUFACTURERS

- Products manufactured by the following companies complying with these specifications will be acceptable: CORRIM Company, Oshkosh, Wisconsin 54901. Telephone (920) 231-2000. Fax (920) 231-2238.

- Products manufactured that have successfully completed ANSI A151.1 Mod. Swing Cycle test in excess of 1,000,000 cycles, with no failure of any design features of the door and have been approved by the Florida Building Code for wind load.

2.02 DOORS
Door Fabrication FRP (Fiberglass Reinforced Plastic) Face Sheets

- Face Sheets: Standard face sheets shall be manufactured using a corrosion resistant resin system with light stabilizing additives. The resin shall be reinforced with fiberglass, 40% by weight.

- Face sheets shall be 0.070" to 0.125" in thickness. Standard being 0.120". Total door thickness to be a nominal 1-3/4".

- Finish:

  - Standard gelcoat color to be gray or white
  - Special gelcoat color to be selected by the architect
  - 15 mils thick coverage, ±3 mils.
  - Smooth, seamless finish

Internal Construction

- Core:

Balsa Core

- Core: Balsa core, of end grain construction, shall be laminated to the interior of the panels. The balsa shall have a density of 8.5 - 9.0 lbs./cu. ft. and shall be 1-1/2" thick. Compressive strength, perpendicular to the door panel surface shall be 1,400 psi.

Hardware Preparations

Reinforcement Blocking;

- Lockset - non-swelling polymer blocking
  Surface mounted hardware - non-swelling polymer blocking
- Thru-bolted hardware - non-swelling polymer blocking

- Mortise Hardware
- Full mortise hinges - non-swelling polymer blocking
- Mortise locksets - to suit template provided
- Exit devices - to suit template provided

- All doors shall be mortised and reinforced to allow application of hinges and locks, in accordance with hardware schedule and manufacturer's templates. The hinges shall be attached by using stainless steel wood screws. Pilot holes shall be in strict accordance to manufacturer's recommendations.

Door Accessories:

- Glazing: Glass support structures shall ensure that the glass area is weather sealed as not to permit moisture to enter the core of the door. This is to be accomplished by utilizing pultruded FRP tubes to fabricate the window opening. Glazing must allow for ready access for repair, in the event of damage or replacement, without affecting
the sealed integrity of the cutout in the door panel itself. Openings cut directly into the core material will not be allowed.

- Louver: Louvers shall be fabricated of FRP material of an inverted "V" design and shall be subject to the same performance guarantee as the door panel. The louver opening will be fabricated in the same method as for glazing above.

- Fasteners: Provide stainless steel fasteners as required for glazing openings and louvers.

- Transoms: All transom panels will be identical to the doors in construction, materials, thickness, color and reinforcement.

- Astragals: Astragals for pairs of doors to be fabricated of FRP material of manufacturer's standard flat design.

2.03 FRAMES
Frame Fabrication FRP (Fiberglass Reinforced Plastic)

- Jamb Depth: 5-3/4" standard. Widths over/under 5-3/4" available upon request, refer to frame schedule for exact sizes. (Galvanized HM at all fire-rated openings, gel coated to match nonrated frames or stainless steel, #304 stainless with a #4 finish.)
- Face Dimension: 2" standard. Headers available in 2" and 4".

- Return: 7/16"

- Rabbet: 1-15/16"

- Corner Miter: Head and Jamb members shall be standard 45-degree miter, providing a neatly mitered corner connection, fabricated for Knocked Down (KD) field assembly.

- Pultrusion: In compliance with pultrusion industry standards

Reinforcements and Braces/Supports

- Corner Reinforcement: 4" x 4" x 5-3/8" x 1/4" thick pultruded fiberglass angle.

Attached to head bar at factory using stainless steel screws or suitable polymer rivets.

- Mortise Hinge Reinforcement: 1-1/2" x 7" x 1/4" thick polymer. Attached to frame by means of bonding and stainless-steel countersunk screws.

- Closer Reinforcement: Same as mortise hinge reinforcement, less screws.

- Strike Reinforcement: 1-1/2" x 9" x 3/4" thick polymer material. Attached to frame by means of bonding and stainless-steel countersunk screws or suitable polymer rivets.

Anchoring Systems

- "T"-Strap or Wire Anchor for masonry construction

- Concealed existing wall anchor if necessary

Finish

- Gelcoat: 15 mils thick, ±3 mils on all exposed surfaces. Color to match door unless otherwise indicated.

2.04 FABRICATION

- Fabricate FRP doors and frames as shown on the drawings and in accordance with best shop practices. Frames shall be rigid, neat in appearance and free from defects. Field measurements shall be taken as required for coordination with adjoining work.

- 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.

- Reinforce members and joints with plates, tubes or angles for rigidity and strength.

- Doors and frames shall be mortised and reinforced for hardware in accordance with the hardware manufacturer’s instructions and templates. The reinforcing shall be designed to receive hinges, locks, strikes, closures, etc.

- Mortar guard boxes shall be provided for hardware cutouts in frames.
- Furnish 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.

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

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

PART 3 - EXECUTION
3.01 INSPECTION
Installer shall 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.

3.02 INSTALLATION

- General: Install FRP doors, frames and accessories in accordance with final shop drawings, NFPA 80 standards at fire-rated openings, and as herein specified. Installation to be similar to that of hollow metal doors and frames, and in accordance with FRP manufacturer's written instructions.

- Frame Installation

o Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary
braces and spreaders leaving surfaces smooth and undamaged. Frame must not be drilled for brace supports as finish may be damaged.

o In masonry construction, locate three (3) wall anchors per jamb at hinge and strike levels. Frames may be grouted full of mortar at jambs and anchors shall be built into the joints as walls are laid up. A continuous bead of silicone sealant is to be applied between the head and jamb at the miter joint.

- Door Installation

o Fit FRP doors accurately in frames, within clearances specified in Paragraph
2.04H of this section.

3.03 TOLERANCES

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

3.04 ADJUSTING

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

3.05 CLEANING

- 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.

- Remove debris from project site.

3.06 WARRANTY

- To include ten (10) years free from defects in materials and workmanship from date of shipment, and lifetime from degradation or failure due to corrosion from date of shipment, provided that the structural integrity of the doors and frames have not been violated or compromised. (No

unauthorized cuts, bores, or other structural alterations affecting the core of the door, or the structure of the frame.)

- Normal wear and tear, or physical abuse of a specific installation is not part of this warranty.

END OF SECTION

SECTION: 08700 HARDWARE
DOORS AND WINDOWS

PART 1 GENERAL
1.01 RELATED DOCUMENTS

Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 WORK INCLUDES

“Finish hardware” includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

1.03 RELATED WORK

Hardware supplier shall check with other sections of this specification for related work such as aluminum entrances, metal doors and frames, wood doors, toilet partitions and accessories, or any other items that may relate to work in this section.

1.04 QUALITY ASSURANCE

A. The finish hardware supplier shall furnish to the General Contractor all finishing hardware as hereinafter specified or as obviously required to complete the project. Items not specifically mentioned but necessary to complete the work shall be furnished, matching in quality and finish to the items hereinafter specified or described. Should an opening be omitted, this supplier shall provide finish hardware equal to that specified for similar or adjacent openings and as approved by the architect for function and quality. No extras will be allowed for omitted buy required items. Clarify all questions with the architect in writing, prior to bid opening.
B. Experience: Hardware shall be furnished by those having experience in the builder’s hardware field, competent to correctly interpret the plans, specifications; to furnish appropriate technician regularly employed by them to immediately service the job as required. This technician shall operate out of a stocking builders warehouse located within 75 miles of the job site in order to insure immediate servicing of the project. This supplier shall make two scheduled visits to the job site during the application of the finish hardware. Prior to each visit, he shall notify the General Contractor and the Architect in writing of his intention to visit the job so that either or both parties may heave representation on the job to discuss any hardware problems that might need to be discussed. In addition, this supplier shall immediately service the job upon the call of the General Contractor and/or the Architect. Upon the completion of the job and prior to the final construction inspection, this supplier shall lubricate and adjust all hardware according to the manufacturer’s recommendations. These service requirements shall be demanded and strictly enforced by the architects.
C. Product Delivery: All items of finish hardware shall be received at supplier’s warehouse, checked for correctness of product, strikes, brackets, screws and miscellaneous items, etc. Hardware is to be accumulate at supplier’s warehouse and as far as practical be delivered in one complete delivery by supplier’s own personnel. Contractor shall refuse drop or factory shipments. Supplier is to coordinate delivery with Contractor and Contractor is to check all items of hardware at the time of delivery with personnel from supplier’s office.

D. Product Handling: Provide secure lock-up for hardware delivered to the project, but not yet

installed. Control the handling and installation of hardware items which are not completely replaceable so that the completion of the work will not be delayed by hardware losses, both before and after installation.

E. Fire Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and the Florida Department of Educations Code requirements. Provide only hardware that has been tested and listed by Underwriters Laboratories, Inc. for types and sizes of doors required and complies with requirements of door and doorframe labels.

F. Adjust and Clean:

1. Adjust and check each operating item of hardware and each door to insure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite- type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
2. Clean adjacent surfaces soiled by hardware installation.
3. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door controls devices to compensate for final operation of heating and ventilating equipment.

PART 2 PRODUCTS

2.01 FASTENINGS

A. Furnish all finish hardware with all necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.

B. Furnish sex bolts for all panic or exit devices and closers.

C. All fastenings shall harmonize with the hardware as to material and finish.

2.02 ACCEPTABLE MANUFACTURERS

Products Approved: (Subject to the series and design approved by Architect) Products for Exterior Doors must be approved by Florida Building Code

Hinges McKinney, Hager and Ives
Locks Sargent, Corbin and Schlage
Thresholds Hager, NGP and Pemko
Misc. Rockwood, Hager and Ives

2.03

HARDWARE SET #1
Doors 1and 4

3 ea. Hinges	TA2314 4.5 x 4.5 NRP	626
1 ea. Dormitory Lk	8205 LNL	626
1 ea. Closer	1431 – UO	689
1 ea. Threshold	520S x DW	Alum
1 set Weather-strip	891S x LR	Alum
1 ea. Door Sweep	770S x DW (Nylon Brush)	Alum

HARDWARE SET #2
Doors 2 and 3

3 ea. Hinges	TA2314 4.5 x 4.5 NRP	626
1 ea. Dormitory Lk	8205 LNL	626
1 ea. Overhead Hld.	598H	626
(Base Metal to be Brass or Stainless Steel)		
1 ea. Threshold	520S x DW	Alum
1 set Weather-strip	891S x LR	Alum
1 ea. Door Sweep	770S x DW (Nylon Brush)	Alum

SECTION: 09290 GYSPSUM DRYWALL
FINISHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Exterior gypsum board for walls.
3. Tile backing panels.

B. Related Sections include the following:
1. Division 5 Section "Cold-Formed Metal Framing" for load-bearing steel framing that supports gypsum board.
2. Division 6 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
3. Division 7 Section "Building Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
4. Division 9 Section "Ceramic Tile" for cementitious backer units installed as substrates for ceramic tile.
5. Division 9 Section “Painting” for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Moisture- and Mold-Resistant Assemblies: Provide and install moisture- and mold-resistant glass-mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C 630 and ASTM C 1177 where indicated on Drawings and in all locations, which might be subject to moisture exposure during construction.
B. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated per ASTM E 119 by an independent testing agency.
1. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated per ASTM E 90 and classified per

ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

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

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

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

2.1 PANELS, GENERAL

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

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
1. Basis-of-Design Product: The design for each type of gypsum board and related products is based on G-P Gypsum products named. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

a. American Gypsum Co.
b. BPB America Inc.
c. Lafarge North America Inc.
d. National Gypsum Company.
e. PABCO Gypsum.
f. Temple.
g. USG Corporation.

B. Moisture Resistant (for use in Hatchery areas, Rooms 121-156):
1. Basis of Design Product: M-Block Mold and Moisture resistant gypsum panels
2. Thickness; 5/8.”
3. Long Edges: Tapered

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: [Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet] [Galvanized or aluminum-coated steel sheet or rolled zinc] [Plastic] [Paper-faced galvanized steel sheet].
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound. Expansion (control) joint.
f. Material: (Hot-dip galvanized steel sheet, plastic, or rolled zinc). (Use plastic in Fish Hatchery areas rooms 121-155.)

3. Shapes:

a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fry Reglet Corp.
b. Gordon, Inc.
c. Pittcon Industries.

3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221
4. Finish: [Corrosion-resistant primer compatible with joint compound and finish materials specified].

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M. B. Joint Tape:
1. Basis-of-Design Product: "G-P Gypsum; Tough Rock Tape."
2. Interior Gypsum Wallboard: Paper.
3. Exterior Gypsum Soffit Board: Paper.
4. Glass-Mat Gypsum Wallboard: Paper
5. Moisture Resistant Wall Board: 10-by-10 glass mesh.
6. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use

formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, beveled panel edges and damaged surface areas, use setting-type taping compound.

a. Basis-of-Design Product: G-P Gypsum; ToughRock Sandable Setting Compound

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges use setting-type taping compound.

a. Basis-of-Design Product: G-P Gypsum; ToughRock Setting Compound

b. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For the second coat, use setting-type, sandable topping compound.

a. Basis-of-Design Product: G-P Gypsum; ToughRock Setting Compound

4. Finish Coat: For third coat, use setting-type, sandable topping compound.

a. Basis-of-Design Product: G-P Gypsum; ToughRock Setting Compound

5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound a. Basis-of-Design Product: G-P Gypsum; ToughRock Setting Compound
D. Joint Compound for Wet Area Applications (Hatchery area):

1. Basis-of-Design Product: USG Sheetrock Brand Dur-Bond Setting-Type Joint Compound 45 or 90. Similar and equal water-resistant joint compound will be considered as an equal.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to the continuous substrate.
1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws are complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of

assembly.

E. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants. “Thermal Insulation: As specified in Division 7 Section "Building Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

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

3.2 APPLYING AND FINISHING PANELS, GENERAL A. Comply with ASTM C 840.
B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

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

D. Form control and expansion joints with space between edges of adjoining gypsum panels.
E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than eight sq. ft. in the area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect, structural members are projecting below the underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

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

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

H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: Vertical surfaces, unless otherwise indicated].
2. Type X: Vertical surfaces, unless otherwise indicated

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in the same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by the fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by the fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws. Insert specific requirements for the substrate in the paragraph below.
5. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

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

B. Control Joints: Install control joints at locations indicated on Drawings

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges
3. L-Bead: Use where indicated
4. U-Bead: Use at exposed panel edges

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use [at exposed panel edges]

3.5 FINISHING GYPSUM BOARD

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

B. Prefill open joints beveled edges and damaged surface areas.
C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and per ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated

a. Primer and its application to surfaces are specified in Painting section 099123 Sections.

E. Water-Resistant Backing Panels: Finish per manufacturer's written instructions. F. Cementitious Backer Units: Finish per manufacturer's written instructions.

3.6 PROTECTION

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

B. Remove and replace panels that are wet, moisture damaged, and/or mold damaged.

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

END OF SECTION 092900

SECTION: 09300 HARD TILE

FINISHES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

Drawings and General Provision of the Contract, including General and Supplementary Condition and Division 1 Specification sections, apply to work of this section.

1.02 SCOPE:

This section includes ceramic tile surfaces, marble and limestone tiles, covering all labor, material and equipment required for the proper execution of the work.

1.03 STANDARDS: Tile Council of America Quality Standards and Handbook for Tile Installation.

1.04 SUBSTITUTIONS: Ceramic tile specified is as made by American Olean but similar and equal material by United States Tile Company or Dal-Tile Corp. will be considered.

PART 2 MATERIALS

2.01 PORTLAND CEMENT: Shall conform to the requirements for such materials as specified under concrete work.

2.02 SAND: Shall be clean and free from organic matter. All sand shall pass Number 5 sieve; 90% shall pass Number 8 sieve; 30% shall pass Number 50 sieve; 5% permitted to pass Number 100 sieve. Percentages are by weight.

2.03 LATH: Shall be 3.4# galvanized key lath, self furring.

2.04 FLOOR: Shall be 8” x 8” Daltile Quarry Tile on or equal porcelain ceramic mosaic with all purpose edges. Colors will be selected by Architect from price group 1 & 2 tile.

2.05 WALL TILE FOR INTERIOR SPACES: Shall be 4”x 4" Daltile or equal porcelain ceramic mosaic with gloss glazed finish. Provide with coves caps and round outs. Color will be selected by Architect from price group 1 & 2 tile.

2.06 MARBLE THRESHOLDS: Shall be cut to profile from Alabama Cream "A" Marble.

2.07 Cement board ½” thick Durock by USG.

2.08 GROUT: Shall be Laticrete 3701 Joint & Grout Filler mixed to proper consistency Colors shall be selected by Architect.

2.09 THIN SET GROUT: Laticrete #4237 & 3030 for Porcelain Tile or Mapi, Karabond/Keralastic.

2.10 LEVELING COAT: Laticrete #3701

2.11 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer. Water proof membrane required at all floor tile in toilet rooms

B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

1. Products: Subject to compliance with requirements, provide one of the following:
a. C-Cure; Pro-Red Waterproofing Membrane 63.
b. Custom Building Products; RedGard Waterproofing and Crack Prevention Membrane.
c. Jamo Inc.; Waterproof Membrane.

2.12 CRACK ISOLATION MEMBRANE

C. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

D. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.

1. Products: Subject to compliance with requirements, Basis of Design:
a. Custom Building Products Crack Buster Pro Crack Isolation Membrane. b.C-Cure Crack Isolation Membrane
c. Jamo Crack Isolation Membrane

PART 3 INSTALLATION

3.01 FLOOR TILE: Shall be laid floors in pattern directed by the Architect. Tile shall be set, grouted and cleaned in accordance with ATC specification for installation of floor tile with latex portland cement mortar, F113-84.

3.02 WALL TILE: Tile shall be set on cement mortar and metal lath over waterproof membrane applied to metal studs in accordance with ATC specification W231-84

accordance with ATC specification W251-84 & on cement backer board or WP Gypsum with Laticrete 3030.

3.03 BACKER BOARD: ½" thick cement board shall be screwed to framing with 1 ¼" screws @ 8"o.c.

3.04 TILE GROUT: Grout shall be with Laticrete #3701; joint and grout filler admix. Installation shall be in accordance with ATC Specifications and Directions of the manufacturer. Color shall be selected by Architect.

3.05 MEMBRANE WATERPROOFING: Below suspended concrete floor and behind wall tile shall extend up wall 8" and secured.

3.06 GROUT JOINTS WITH LATICRETE: Grout with grout admixture.

END OF SECTION

SECTION: 09900 PAINTING
FINISHES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:
Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 SCOPE:
This section includes the furnishing of all labor and material and equipment necessary for the complete painting of all surfaces (unless specifically excepted) on both interior and exterior of the project.

1.03 The painting Contractor will be responsible for the inspection of the work of others prior to the application of paint or other finishes. If any surface to be finished cannot be put in proper condition of finishing by customary cleaning, sanding or puttying operations, the Painting Contractor shall immediately notify the General Contractor or Architect in writing or assume responsibility for and rectify and unsatisfactory finish resulting.

1.04 RELATED WORK:
A. Carpentry and Architectural Woodwork
B. Concrete
C. Plastering
D. Structural Steel
E. Miscellaneous Metals

1.05 SUBSTITUTIONS: Paints specified are the products of the Coronado Paint Company, but similar and equal first line products by Sherwin Williams and PPG will be considered as equals.

PART 2 MATERIALS

2.01 INTERIOR WOOD SURFACES (PIGMENT PAINTED): A. One coat 37-11 Oil Undercoat
B. Two coats 151-270 Clear Satin

2.02 INTERIOR FERROUS METAL:
Sand and touch up abraded and rusted surfaces in shop coat primer. A. One coat 35-11Alkyd Metal Primer
B. Two coats 27 Line Oil Semi Gloss/90 Line Acrylic Semi-Gloss

2.03 INTERIOR GYP. BOARD
A. One coat 40-11 PVA primer
B. Two coats 34 Line Velvet

2.04 CANVAS COVERED PIPE:
A. One coat 40-11 PVA primer
B. One coat 34 Line Velvet Walls

2.05 EXTERIOR FERROUS METAL:
Sand and touch up abraded and rusted surfaces with red oxide protective primer. A. One coat 35-11 Metal Primer/36-11 Primer for Galvanized Surfaces

B. Two coats 31 Line Oil High Gloss

2.06 EXTERIOR SYNTHETIC WOOD SURFACES (PIGMENT PAINTED): A. One coat gold acrylic house coat primer 410-11
B. Two Coats 100% Crylicote Gold Acrylic satin 410 line

2.07 FIBERGLASS DOORS
A. Two coats Rust Scat 90 line

PART 3 WORKMANSHIP
3.01 Properly prepare, fill, sand and clean all surfaces to be painted.

3.02 Apply paint to flow on smoothly and evenly to proper film thickness with brush, roller or spray as indicated for various surfaces and materials. Cut paint neatly at unpainted materials and areas.

3.03 The number of coats specified herein is normally sufficient to obtain a satisfactory finish, but, should the finish not be acquired, it will be the responsibility of the Painting Contractor to apply such additional coats as may be required at no additional expense to the Owner.

3.04 Apply all items under this specification in strict accordance with the Manufacturer's directions. Adhere to specified drying times between coats.

3.05 Sand lightly with 5-0 paper on steel wool between all coats of pigment paint and varnish. Wood fillers shall be rubbed with rough cloth.

3.06 Work only under favorable weather conditions.

3.07 Top and bottom edges of all cabinet and passage doors will be finished same as faces.

3.08 Back prime all millwork before installation.

3.09 Fill all holes after prime coat.

3.10 Protect all hardware, plate accessories, etc., from paint.

3.11 Pressure wash exterior of existing buildings prior to painting

3.12 Within 48 hours of painting rinse all of exterior surfaces with clean fresh water to remove salt.

3.13 Allow concrete to cure 30 days before applying ICI Groundworks concrete sealer. Apply using a ½" nap polyester roller cover. Allow to dry thoroughly between coats.

PART 4 SURFACES NOT TO BE PAINTED

4.01 Brick
4.02 Metal Roofing and Siding.
4.03 Walks, Floor Covering
4.04 Glazed and unglazed tile

4.05 Plastic laminate
4.06 Aluminum and copper surfaces
4.07 Stainless steel surfaces
4.08 Toilet partitions
4.09 Acoustical Ceilings
4.10 Hardware
4.11 Glass
4.12 Stone & Marble

ALL OTHER SURFACES UNLESS OTHERWISE DIRECTED BY ARCHITECT ARE TO BE PAINTED.

END OF SECTION

SECTION: 10140 INTERIOR SIGNS
SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide specialty building signage. Note: Exterior building signage is shown on A200. See Allowance Section 012100.

1.02 SUBMITTALS

A. Submit for approval samples, shop drawings, product data.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. All signs shall comply with Florida Accessibility Code for Building Construction. Provide products of acceptable manufacturers which have been in satisfactory use in similar service
for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Panel signs; as manufactured by Mohawk signs or approved equal. Provide one for each room and room number shown on floor plans. Provide exterior grade
signs for doors entered from outside. Provide one for each room on the floor plan.

1.	Material:	Sand carved MP plastic, 1/32” H. raised graphics
2.	Size:	Minimum 6 inches square, radiused corners
3.	Face Finish/Color:	Matte finish/Color selected by Architect
4.	Number Style:	Helvetica Medium
5.	Number Size:	1 inch
6.	Number Copy Position:	Top left
7.	Letter Style:	Helvetica Medium
8.	Letter Size:	3/4" uppercase
9.	Letter Copy Position:	Bottom left
10.	Braille:	Grade 2, left justified below number/letter
11.	Number/Letter Color:	White
12.	Mounting: Non-corrosive fasteners and anchors	

PART 3 - EXECUTION

3.01 INSTALLATION

A. Panel signs shall be wall mounted at sixty (60) inches above finish floor to center of sign on

latch side of doors. Exact location shall be as directed by Owner.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance.

C. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

D. Restore damaged finishes. Clean and protect work from damage.

3.02 SIGN SCHEDULE

A. Space Identification: Provide sign indicating room name and number for each space identified on floor plan.

B. Accessibility Signage: In addition to room name and number, provide sign with international symbol of accessibility at all toilet rooms.

END OF SECTION

SECTION: 10162 TOILET PARTITIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services for toilet partitions as shown on drawings and as specified, in accordance with provisions of the contract documents, and completely coordinate with work of all other trades.

1.03 Verify dimensions by field measurements before fabrication, wherever possible without delaying project.

PART 2 SUBSTITUTIONS

2.01 Toilet partitions specified are by Comtec, but equal and similar products by Santana Products and Sanymetal will be considered.

PART 3 SUBMITTALS

3.01 Shop drawings (7 copies) for fabrication and erection; include plans and elevations. Show all anchorage and accessory items, hardware and finishes.

PART 4 MATERIALS

4.01 All partitions shall be equal to overhead braced, solid polymer HD by Santana in colors that extend through the entire thickness of the panels. Colors to be selected by the Architect.

4.02 Doors and panels shall be 55" high and mounted at 14" above finished floor.

4.03 Pilasters shall be 82" high and fastened to non-corrosive polymer resin shoes.

4.04 All hardware shall be fabricated from heavy aluminum extrusion (6463-T5 alloy) with clear anodized finish.

4.05 Bumper Coat Hook: Provide rubber tipped combination bumper and coat hook for each compartment.

4.06 Paper holders are provided under Section 10800.

PART 5 INSTALLATION

5.01 Install in a rigid, straight, plumb and level manner with layout as indicated. Provide not more than ½" clearance between pilasters and panels, and not more than 1" clearance between panels and walls.

5.02 No evidence of drilling, cutting or patching shall be visible in the finished work.
END OF SECTION

SECTION: 10441 FIRE EXTINGUISHERS & CABINETS

SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.02 SCOPE:

This section includes the furnishing and installation of extinguisher cabinets and extinguishers.

1.03 SUBMITTALS:

Shop drawings and manufacturer's product data will be furnished the Architect for approval prior to ordering. See Section 013300 for submittal requirements.

1.04 SUBSTITUTIONS:

Cabinets and Extinguishers Specified are as manufactured by Larsen Manufacturing Co., but equal & similar units by Elkhart Brass Manufacturing Co., or J. & L. Industries or equal will be considered.

PART 2 MATERIALS

2.01 EXTINGUISHER CABINET & EXTINGUISHERS:

Provide extinguishers MP10 - UL Rating 4A-60B-C with wall mounting brackets. Provide the number of units shown on the plans, designated FE.

SECTION: 10800 TOILET ACCESSORIES

SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

Drawings and General Provision of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 SCOPE:

The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services for toilet and bath accessories as shown on drawings and as specified, in accordance with provision of the contract documents, and completely coordinate with work of all other trades. Refer to drawings for quantities and locations.

1.03 RELATED WORK: A. Hard Tile
B. Light Steel Framing
C. Carpentry D. Masonry E. Painting

1.04 SUBSTITUTIONS:

Accessories as manufactured by Bobrick are specified
Grab Bars as manufactured by Ponte Giulio are specified

1.05 SUBMITTALS:
Submit for approval to the Architect 7 copies of the following: A. Copies of manufacturer's installation instructions.
B. Shop Drawings showing quantities.

PART 2 MATERIAL

2.01 Furnish and install the following items:

ITEM DESCRIPTION

A. Mirror 18”X 24” B-165 Framed Mirror

B. Paper Towel Dispenser B-263 Surface Mounted Towel Dispenser

C. Soap Dispenser B-5050 Matrix Surface Mounted Dispenser

D. Grab Bars GO2JASXX07 PVC Coated 18 Gauge Steel
1½" dia. 36"

D2. Grab Bars GO2JASXX08 PVC Coated 18 Gauge Steel
1½" dia. 42"

E. Toilet paper dispenser B-52891 Matrix Jumbo Roll Dispenser

F. Partition mounted Sanitary
Napkin Disposals B-353 Classic series Disposal

F2. Recessed Sanitary
Napkin Disposals B-354 Classic Series Disposals

G. Trash Receptacle B-2277 Surface Mounted Waste Receptacle

H. Baby Changing Station KB-101-00 Vertical Wall Mounted Baby Changing Station

PART 3 INSTALLATION

3.01 Grab bars and installation of same shall comply with ANSI A 117/1 (1980).

3.02 Verify all quantities and details from plans.

END OF SECTION

SECTION: 12931 BIKE RACKS
FURNISHINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

Drawings and General Provision of the Contract, including General and Supplementary Condition and Division 1 Specification sections, apply to work of this section.

1.02 SCOPE:
This section includes thermoplastic coated, stainless steel, loop type bike racks and all labor, material and equipment required for the proper execution of the work.

1.03 RELATED SECTIONS:
Section 03300 - Cast-in-Place Concrete: Concrete footings for support of bike racks.

1.04 STANDARDS:

A. American Society for Testing and Materials (ASTM) Publications:

1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

2. ASTM D822 - Tests on Paint and Related Coatings Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.

3. ASTM D1794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

4. ASTM D3363 - Test Method for Film Hardness by Pencil Test.

1.05 SUBSTITUTIONS.
A. Bike racks are by Park n Pool of Lexington, VA (877) 777-3700. Other similar and equal products will be considered if they meet the requirements of this specification and are submitted in accordance with requirements of section 01631.

1.06 SUBMITTALS:
1. Product data for components and accessories.

2. Shop drawings showing layout, dimensions, spacing of components.

3. Copy of warranty specified in Paragraph 1.4 for review by Architect.

1.07 WARRANTY
5 years warranty for factory finish against cracking, peeling, and blistering under normal use.

PART 2 MATERIALS

A. Loop Style

B. Stainless steel

C. Thermoplastic Coating

D. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, and water reducing and plasticizing additives.

E. Provide racks of type and size indicated on Drawings.

1. Construction: 2 3/8" diameter stainless steel bike racks with thermoplastic coating. Provide coated extensions on the racks for setting in a concrete footing. F. Factory Finish
1. Stainless steel racks are to be coated with 3-coat application of thermoplastic coating.

2. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95 degrees F and 95 percent relative humidity and after 1000 hours less than [3/16 inch] [5 mm] undercutting.

3. Weather ability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1-year exposure in South Florida with test panels tilted at 45 degrees.

PART 3 INSTALLATION

1. Install racks in a level and plumb fashion. Set in concrete footing and provide bracing which does not penetrate the coating until concrete is set. Concrete will be laid over mounting pipes. Provide thermoplastic coated escutcheons to trim out around concrete paving.

END OF SECTION

SECTION: 12932 - BOLLARDS & BOLLARD COVERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

Drawings and General Provision of the Contract, including General and Supplementary Condition and Division 1 Specification sections, apply to work of this section.

1.02 SCOPE:

This section includes concrete filled aluminum bollards and thermoplastic bollard covers. coated, and all labor, material and equipment required for the proper execution of the work.

1.03 RELATED SECTIONS:

Section 03300 - Cast-in-Place Concrete: Concrete footings for bollards.

1.04 STANDARDS:

A. American Society for Testing and Materials (ASTM) Publications:

1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

2. ASTM D822 - Tests on Paint and Related Coatings Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.

3. ASTM D1794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

4. ASTM D3363 - Test Method for Film Hardness by Pencil Test.

1.05 SUBSTITUTIONS.

A. Pipe bollards and thermoplastic pipe bollard sleeves are by Bollards NSleeeves.com of Lexington, VA (800) 914-4771. Other similar and equal products will be considered if they meet the requirements of this specification and are submitted in accordance with requirements of section 01631.

1.06 SUBMITTALS:

1. Product data for components and accessories.

2. Shop drawings showing layout, dimensions, spacing of components.

3. Copy of warranty specified in Paragraph 1.4 for review by Architect.

1.07 WARRANTY

5 years warranty for factory finish against cracking, peeling, and blistering under normal use.

PART 2 MATERIALS

A. Aluminum bollard

B. Thermoplastic Sleeve

C. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, and water reducing and plasticizing additives.

D. Provide bollards of type and size indicated on Drawings.

1. Construction: 4” Schedule 40, aluminum pipe
2. ¼” thick Polyethylene Thermoplastic bollard sleeves

PART 3 INSTALLATION

1. Install bollards in a level and plumb fashion. Set in concrete footing and provide bracing until concrete is set. Brick pavers will be laid around bollards and above concrete footing. Install thermoplastic bollard covers over aluminum bollards. Secure bollard covers with stainless steel screws.

END OF SECTION

SECTION 061753 SHOP FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood roof trusses.
2. Wood girder trusses.

1.2 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners. B. Shop Drawings: Show fabrication and installation details for trusses.
1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
5. Show splice details and bearing details.

C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as definedin Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.

B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1.

C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 61000 "Rough Carpentry."

2.3 METAL CONNECTOR PLATES

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

1. Alpine Engineered Products, Inc.; a division of ITW Building Components Group, Inc.
2. MiTek Industries, Inc.
3. Truswal Systems Corporation.

B. General: Fabricate connector plates to comply with TPI 1.

C. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

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

1. Simpson Strong-Tie Co., Inc.
2. USP Structural Connectors.

B. Allowable design loads, as published by manufacturer, shall comply with or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

2.6 FABRICATION

A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and

secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

F. Securely connect each truss ply required for forming built-up girder trusses.

G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Section 61000 "Rough Carpentry."
2. Install and fasten strongback bracing vertically against vertical web of parallel- chord floor trusses at centers indicated.

H. Install wood trusses within installation tolerances in TPI 1.

I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
J. Replace wood trusses that are damaged or do not comply with requirements.
END OF SECTION 061753

SECTION 22 00 00 MECHANICAL GENERAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. This is a Basic Mechanical Requirements Section. Provisions of this section apply to work of all Division 22 and 23 sections.

C. Review all other contract documents to be aware of conditions affecting work herein.

D. All work under Division 22 shall be constructed in accordance with the codes listed herein. The design has been based on the requirements of these codes; and while it is not the responsibility of the Contractor to verify that all work called for complies with these codes, he shall be responsible for calling to the Architect/Engineer's attention any details or specifications that are not in conformance with these or other codes.

E. Where code conflict exists, generally the most restrictive requirement applies. Comply with current code edition, unless noted.

1. 2017 Florida Building Code.
2. National Electric Code (NFPA 70).
3. Life Safety Code (NFPA 101).
4. Air Conditioning and Ventilating Systems (NFPA 90A).
5. Standard for the Installation of Sprinkler Systems (NFPA 13).
6. Handicapped Accessibility, ANSI A117.1 and Florida Statute Chapter 553, Part V.

F. All mechanical materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments, to the extent referenced:

1. Underwriters' Laboratories (UL)
2. American National Standards Institution (ANSI)
3. American Society of Testing Materials (ASTM)
4. Air Conditioning and Refrigeration Institute (ARI)
5. National Fire Protection Association (NFPA)
6. National Electrical Manufacturers Association (NEMA)
7. Sheet Metal and Air Conditioning Contractors' National Association SMACNA)
8. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
9. Air Movement and Control Association (AMCA)

G. Codes or standards applying to a specific part of the work may be included in that section.

H. Comply with regulations and codes of suppliers of utilities.
I. Where no specific method or form of construction is called for in the contract documents, the
Contractor shall comply with code requirements when carrying out such work.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Joining Materials.
3. Transition fittings.
4. Dielectric fittings.
5. Flexible Connectors.
6. Excavation and backfill.
7. Mechanical demolition.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.

1.3 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, unexca- vated spaces, crawlspaces, 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 tem- peratures 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. Ex- amples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

H. Provide: Furnish and install, complete and ready for intended use.

I. Furnish: Supply and deliver to project site, ready for subsequent requirements.

J. Install: Operations at project site, including unloading, unpacking, assembly, erection,

placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

K. Permits and Fees: Contractor shall purchase all necessary permits, meters, and pay for any in- spections required for his work and pay all fees and charges incidental thereto.

L. Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy him- self as to the accuracy of all data as indicated in these plans and specifications and/or as provid- ed by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Architect/Engineer in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an ac- ceptance of the data by him after which time the Contractor has no claim against the Owner re- sulting from alleged errors, omissions or inaccuracies of the said data.

M. Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide pro- tection from the weather and accidental damage.

N. Extent of work is indicated by the drawings, schedules, and the requirements of the specifica- tions. Singular references shall not be constructed as requiring only one device if multiple de- vices are shown on the drawings or are required for proper system operation.

1.4 FIELD MEASUREMENTS AND COORDINATION:

A. The intent of the drawings and specifications is to obtain a complete and satisfactory installa- tion. Separate divisional drawings and specifications shall not relieve the Contractor or subcon- tractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.

B. Verify all field dimensions and locations of equipment to insure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimen- sion and locations.

C. Coordinate work in this division with all other trades in proper sequence to insure that the total work is completed within contract time schedule and with a minimum cutting and patching.

D. Locate all apparatus symmetrical with architectural elements. Install to exact height and loca- tions when shown on architectural drawings. When locations are shown only on mechanical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.

E. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval.
F. Carefully examine any existing conditions, piping, and premises. Compare drawings with ex- isting conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify problems in a timely manner. Written instruc- tions will be issued to resolve discrepancies.

G. Because of the small scale of the drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the

sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate piping, ductwork, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or per- form work without such verification. No extra compensation will be allowed because field measurements vary from the dimensions on the drawings. If field measurements show that equipment or piping cannot be fitted, the Architect/Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to en- croach on space assigned to another use.

H. Coordinate with the General Contractor for all cutting and patching. Contractors performing Division 22 work shall inform the General Contractor of all cutting and patching required prior to bidding and shall coordinate installation.

1.5 SUBMITTALS

A. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building compo- nents. Drawings shall be prepared by the contractor using AutoCAD 2007 or higher. The En- gineer will supply base floor plans only. All other work shall be by the contractor. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.
2. Planned ductwork layout, including dampers, elbows, etc.
3. Clearances for installing and maintaining insulation.
4. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
5. Equipment and accessory service connections and support details.
6. Exterior wall and foundation penetrations.
7. Fire-rated wall and floor penetrations.
8. Access panel and door locations.
9. Sizes and location of required concrete pads and bases.
10. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
11. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
12. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

B. Samples: Of color, lettering style and other graphic representation required for each identifica- tion material and device.

C. When approved, the submittal control log and submittals shall be an addition to the specifi- cations herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.

D. Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following:

1. Submittals shall be properly organized in accordance with the approved submittal control log.
2. Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.
3. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.
4. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date on the cover sheet.
5. Submittals that include a series of fixtures or devices (such as plumbing fixtures or valves) shall be organized by the fixture number or valve type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.
6. The design shown on the drawings supports the mechanical equipment basis of design specifications at the time of design. If mechanical equipment is submitted with different electrical, physical, capacity, etc. requirements, it shall be the responsibility of the mechanical contractor to resolve all required design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, ductwork modifications, etc.) and clearly show the new design on the mechanical submittal with a written statement that this change will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

E. If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writ- ing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Con- tractor will not be relieved of the responsibility for executing the work in accordance with the contract.

F. Review of shop drawings, product literature, catalog data, or schedules shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

G. Submit shop drawings as called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than 1/4" per foot), with dimensions clearly showing the installa- tion. Direct copies of small scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other sections and shall show space allotted for it. Include construction details and materials.

H. Test Reports and Verification Submittals: Submit test reports, certifications and verification letters as called for in other sections. Contractor shall coordinate the required testing and docu- mentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports and take corrective action within the scheduled contract time.

I. O&M Data Submittals: Submit Operation and Maintenance data as called for in other sections.
When a copy of approval submittals is included in the O&M Manual, only the final Approved or Approved as Noted copy shall be used. Contractor shall organize these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required by Division 1 and as described herein. Submit manuals at the Substantial Completion inspection.

1.6 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural
Welding Code-Steel."

B. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

C. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure
Vessel Code: Section IX, "Welding and Brazing Qualifications."

D. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

E. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

F. The design and layout shown on the drawings are based on the Manufacturers listed in the Di- vision 22 specifications. If equipment other than that of the Manufacturers indicated is submit- ted to the Engineer for consideration as an equal, it shall be the responsibility of the Manufacturer requesting approval to submit with the request a revised drawing(s) of the mechanical equipment layouts acceptable to the Engineer. These revised drawings shall show the proposed location(s) of the alternate unit(s) and the area required for withdrawal space of replacement or serviceable components. These drawings shall also show clearances of adjacent equipment and the service area required by that equipment.

G. Equipment Selection: Equipment of differing electrical characteristics, physical dimensions and/or weights, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical, electrical, structural, and architectural services (such as circuit breakers, conduit, motors, bases, equipment pads, and equipment spaces) are adjusted by the contractor accordingly. The additional costs resulting from these modifications shall be the responsibility of the Contractor and no costs resulting from these modifications shall be passed to the Owner. If minimum energy ratings or efficiencies of equipment are spec- ified, equipment must meet design and commissioning requirements.

1.7 CORDINATION
A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

H. Refer to other Division 22 or 23 sections and/or drawings for specific requirements of the particular piping system being installed. Where another Division 22 or 23 section or the drawings conflict with requirements of this section, the other Division 22 or 23 section or the drawings shall take precedence over the general requirements herein.

I. OSHA: Contractor employee worker protection for all trenching and excavation operations shall comply with 29 CFR 1926.650 Subpart P and all current OSHA requirements.

1.8 MULTI-DISCIPLINE COORDINATION

A. DIVISION 2 SITE WORK

1. Refer to Division 31, 32 and 33, Sitework for:

a. All water, sewer, and storm water piping greater than five feet from the building b. Manholes and catch-basins.
c. Underground tanks and enclosures. d. Site fire protection work.

B. DIVISION 3 CONCRETE

1. Refer to Division 3, Concrete for:

a. Rough grouting in and around mechanical work.
b. Patching concrete cut to accommodate mechanical work.
2. The following is part of Division 22 work, complying with the requirements of Division 3

a. Curbs, foundations and pads for mechanical equipment. b. Basins, sumps, and vaults of mechanical work.
c. Underground structural concrete to accommodate mechanical work. d. Inertia bases.

C. DIVISION 4 MASONRY

1. Refer to Division 4, Masonry for:

a. Installation of access doors in walls.

D. DIVISION 5 METALS

1. Refer to Division 5, Metals for:

a. Framing openings for mechanical equipment.

2. The following is part of Division 22 work. a. Supports for mechanical work.

E. DIVISION 6 WOOD AND PLASTIC

1. Refer to Division 6, Wood for:

a. Framing openings for mechanical equipment

F. DIVISION 7 THERMAL AND MOISTURE PROTECTION

1. Refer to Division 7, Thermal and Moisture Protection for:

a. Installation of all roof curbs and roof supports for mechanical work.
b. Caulking and waterproofing of all wall and roof mounted mechanical work. c. Providing all roof curbs and all vent flashing for metal roofs.

2. The following is part of Division 23 work, complying with the requirements of Division 7.

a. Fire barrier penetration seals.

G. DIVISION 8 DOORS AND WINDOWS

1. Refer to Division 8, Doors & Windows for:

a. Installation of all door grilles. b. Providing all undercuts

H. DIVISION 9 FINISHES

1. Refer to Division 9, Finishes for:

a. Painting exposed ductwork, piping, and equipment.
b. Painting structural metal and concrete for mechanical work. c. Painting door grilles and access panels.

d. Painting color-coded mechanical work indicated for continuous painting. See color schedule in Division 23 section, "Mechanical Identification". e. Installation of access doors in gypsum drywall.
f. Colors shall be selected by the Architect for all painting of exposed mechanical work in occupied spaces, unless specified herein. Do not paint insulated or jacketed surfaces.

2. Perform the following as part of Division 22 work:

a. Touch up painting of factory finishes. b. Painting of all hangers.

I. DIVISION 10 SPECIALTIES

1. Refer to Division 10, Specialties for:

a. Fire extinguishers and fire extinguisher cabinets and accessories.

J. DIVISION 11 EQUIPMENT

1. Refer to Division 11, Equipment for:

a. Equipment for all laboratory equipment including cabinets, casework, student stations, demonstration desks, safety stations, eyewashes, and all related fixtures, fittings, and trim.

2. Provide the following as part of Division-22 work:

a. All trim including faucets, waste connections, drain traps, vents, valves, piping, flashing, fittings, strainers, and other materials necessary to make equipment operational. Provide rough-in for all equipment. Provide final connections for all equipment.
b. All fixtures specified in Contract Documents.
c. All trim not furnished by Division 11 including drains, wastes, continuous wastes, tailpieces, traps and similar devices necessary to make fixtures operational. Provide rough-in for all fixtures. Provide final connections for all fixtures. Provide all fixtures specified in Contract Documents.

K. DIVISION 26 ELECTRICAL

a. Mechanical contractor shall coordinate the exact electrical requirements of all mechanical equipment being provided with the electrical contractor. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the mechanical equipment basis of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this design will be provided at no additional cost. Mechanical submittals made with no written reference to

the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

b. Mechanical contractor shall provide all HVAC control wiring including the Energy Management Control system sensors, alarms, and input/output signals and all relays, interlocks, warning lights, and control devices, complying with the requirements of Division 26. The intent is for the mechanical contractor to be responsible for the entire HVAC control system, including point-to-point wiring and connections.

c. Electrical contractor shall provide disconnect switches, starters, and contactors for mechanical equipment unless specifically noted as being furnished as part of mechanical equipment.

d. Electrical contractor shall provide all power wiring, raceway and devices, and make final electrical connections to all mechanical equipment, switches, starters, contactors, controllers, and similar equipment.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. All materials shall be new or Owner-supplied reused as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

B. All equipment and materials shall be new and the most suitable grade for the purpose intended. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.

C. Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.

D. The label of the approving agency, such as UL, IBR, ASME, ARI, AMCA, by which a standard has been established for the particular item shall be in full view.

E. The equipment shall be essentially the standard product of a manufacturer regularly engaged
in the production of such equipment and shall be a product of the manufacturer's latest design.

F. A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

G. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.

H. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the

drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation.

I. Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

2.2 REQUESTS FOR SUBSTITUTION

A. Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on a particular system, product or material specified.

B. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

1. Required product cannot be supplied in time for compliance with Contract time requirements.
2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.
3. Substantial cost advantage is offered Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.

C. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of
design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

1. Principal of operation.
2. Materials of construction or finishes.
3. Thickness of gauge of materials.
4. Weight of item.
5. Deleted features or items.
6. Added features or items.
7. Changes in other work caused by the substitution.
8. Performance curves.

If the approved substitution contains differences or omissions not specifically called to the attention of the Architect/Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products (or to have the substituted products replaced) at the Contractor's expense.

1.4 EXCAVATION AND BACKFILL MATERIALS

A. Sand: Clean, hard, uncoated grains free from organic matter or other deleterious

substances.
Sand for backfill shall be of a grade equal to mortar sand.
B. Gravel: Clean, well graded hard stone or gravel, free from organic material. Size range to be from No. 4 screen retentions to 1".
C. Earth: Fill free of clay, muck, stones, wood, roots or rubbish.
D. Identification Tape: Polyethylene 6 inches wide, 0.004 inches thick, continuously printed with
"CAUTION" in large letters and type of pipe below.
E. Copper Identification Wire: 14-gauge. PART 3 - EXECUTION
1.1 WORKMANSHIP

A. All materials and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Architect/Engineer.

1.2 COORDINATION

A. The Contractor shall be responsible for full coordination of the mechanical systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for piping, ductwork, or other equipment passing through slabs or walls.

B. Any additional steel supports required for the installation of any mechanical equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.
C. It shall be the Contractor's responsibility to see that all equipment such as valves, dampers, filters and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.

D. All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.

E. The contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.

F. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

G. Start of work will be construed as acceptance of suitability of work of others.

H. Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Architect/Engineer and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.

I. Provide all required temporary valves, piping, ductwork, equipment and devices as required.

Maintain temporary services to areas as required. Remove all temporary material and equipment on completion of work unless Engineer concurs that such material and equipment would be beneficial to the Owner on a permanent basis.

J. Notify General Contractor to do all cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Architect/Engineer before cutting any structural items.

K. Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.

L. Touch-up factory finishes on equipment located inside and outside shall be done under Division 23. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as re- quired.

M. Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.

N. Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

O. Operate heating and cooling systems as required after initial startup to maintain temperature and humidity conditions to avoid freeze damage and warping or sagging of ceilings and carpet.

1.3 RECORD DRAWINGS

1. During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all piping, ductwork, equipment, and other systems which are not installed exactly as shown on the contract drawings.

2. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.

1.4 ACCEPTANCE

1. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.

2. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.

3. Operation and Maintenance Manuals: Furnish four complete manuals bound in ring binders with Table of Contents, organized, and tabbed by specification section. Manuals shall contain:

a. Detailed operating instructions and instructions for making minor adjustments. b. Complete wiring and control diagrams.
c. Routine maintenance operations.
d. Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
e. Copies of approved submittals.
f. Copies of all manufacturer's warranties.
g. Copies of test reports and verification submittals.

4. Record Drawings: Submit record drawings.

5. Control Diagrams: Frame under plastic and mount on equipment room wall.

1.5 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 and/or 23 Sections specifying piping systems. Individual Division 22 and/or 23 piping Sections specify unique piping installation requirements

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction
loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping such that no piping passes over electrical panels.

F. Refer to fire protection, plumbing and HVAC specifications for sleeve, sleeve seal system and escutcheon requirements.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

H. Install piping to permit valve servicing.

I. Install piping at indicated slopes.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install piping to allow application of insulation.

M. Select system components with pressure rating equal to or greater than system operating pres- sure.

N. Verify final equipment locations for roughing-in.

O. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

1.6 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

1.7 PAINTING

A. Apply paint to exposed uninsulated piping according to the following:

1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

B. Do not paint piping specialties with factory-applied finish.

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

1.8 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in

both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement.

1.9 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment

B. Field Welding: Comply with AWS D1.1.

1.11 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

1.12 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout. D. Avoid air entrapment during placement of grout. E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

1.13 EXCAVATION AND BACKFILL

A. Ditching and Excavation: Shall be performed by hand wherever there is a possibility of encountering obstacles or any existing utility lines of any nature whatsoever. Where clear and unobstructed areas are to be excavated, appropriate machine excavation methods may be employed. Avoid use of machine excavators within the limits of the building lines.

B. Bedding: Excavate to bottom grade of pipe to be installed, and shape bed of undisturbed earth to contour of pipe for a width of at least 50% of pipe diameter. If earth conditions necessitate excavation below grade of the pipe, such as due to the presence of clay, muck, or roots, subcut and bring bed up to proper elevation with clean, new sand, deposited in 6" layers and tamped. Notify Architect/Engineer if subcut exceeds 12", or if bed is of an unstable nature. In this case a 6" minimum layer of gravel will be required before sand bedding begins. Submit cost proposal if the earth conditions require subcut in excess of 12" or if gravel is required to

achieve proper bedding.

C. Placing: Pipe shall be carefully handled into place. Avoid knocking loose soil from the banks of the trench into the pipe bed. Rig heavier sections with nylon slings in lieu of wire rope to avoid crushing or chipping. Pipe which is handled with insulation in place, coated pipe, and jacketed pipe shall have special handling slings as required to prevent damage to the material.

D. Backfilling: Deposit clean new sand to 6" above the pipe and tamp. Then deposit sand or earth carefully in 6" layers, maintaining adequate side support, especially on nonferrous piping materials. Compact fill in 6" layers, using mechanical means, up to the top elevation of the pipe, and in 12" layers to rough or finish grade as required. Fine grade and restore surface to original condition.

E. Special: Excavations shall be installed and maintained in satisfactory condition during the progress of the work. Subsurface structures are to be constructed in adequately sized excavations. De-watering equipment shall be installed and properly maintained where required. Shoring shall be employed in the event of unstable soil condition, and in all cases where required by OSHA regulations and necessary to protect materials and personnel from injury.

F. Identification: Install identification tape directly above all underground piping, one tape for each pipe where multiple pipes are installed. Depth of tape shall be at least 6 inches below finished grade and 24" above buried pipe. Install copper wire above non-metallic pipes.

G. Depth of Cover: Minimum cover for underground piping is two feet unless indicated other- wise.

END OF SECTION 22 00 00

SECTION 220518 ESCUTHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. PART 2 - PRODUCTS
2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners. PART 3 - EXECUTION
3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with
OD that completely covers opening.

1. Escutcheons for New Piping:
a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type. b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast- brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD
that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials. END OF SECTION 220518

SECTION 22 05 53 IDENTIFICATION FOR PLUMBING PIPING & EQUIPMENT

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.3 ACTION SUBMITTALS

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

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors. C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. 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.
4. Fasteners: Stainless-steel rivets or self-tapping screws.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 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.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of plumbing equipment. B.Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting"

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment or in concealed spaces.
7. Pipe stenciling or painting of piping identification is not permitted.

C. Pipe Label Color Schedule:

1. Domestic Water Piping:

a. Background Color: Blue. b. Letter Color: White.

2. Sanitary Waste and Vent Piping:

a. Background Color: Black. b. Letter Color: White.
END OF SECTION 22 05 53

SECTION 22 07 19 PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Sanitary waste piping exposed to freezing conditions.
3. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.

1.4 INFORMATIONAL SUBMITTALS A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 COORDINATION

A. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

B. Coordinate installation and testing of heat tracing. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

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

a. Pittsburgh Corning Corporation; Foamglas. b. Engineer approved equal.
2. Special-Shaped Insulation: ASTM C 552, Type III.
3. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
4. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

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

a. Aeroflex USA, Inc.; Aerocel. b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

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

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.
b. Engineer approved equal.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

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

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.

d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

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

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive. c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with
MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

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

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
b. Eagle Bridges - Marathon Industries; 570.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

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

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 SEALANTS A. Joint Sealants:
1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. 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).

B. FSK and Metal Jacket Flashing Sealants:

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

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller

Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. 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).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

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

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Engineer approved equal.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. 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).

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

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

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
b. Vimasco Corporation; Elastafab 894.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

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

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series. c. Proto Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

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

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing. c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

a. Same material, finish, and thickness as jacket.
b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows. c. Tee covers.
d. Flange and union covers. e. End caps.
f. Beveled collars.
g. Valve covers.
h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic

adhesive, complying with ASTM C 1136.

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

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836. c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive;
complying with ASTM C 1136.

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

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827. c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive;
suitable for indoor and outdoor applications.
1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 370 White PVC tape. b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

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

a. ABI, Ideal Tape Division; 488 AWF.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800. c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

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

a. ITW Insulation Systems; Gerrard Strapping and Seals. b. RPR Products, Inc.; Insul-Mate Strapping and Seals.

2.10 PROTECTIVE SHIELDING GUARDS A. Protective Shielding Pipe Covers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Engineered Brass Company.
b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products. c. McGuire Manufacturing.
d. Plumberex.
e. Truebro; a brand of IPS Corporation.
f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold- water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Truebro; a brand of IPS Corporation.
b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces;
free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs. E. Install multiple layers of insulation with longitudinal and end seams staggered.
F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
G. Keep insulation materials dry during application and finishing.
H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate

and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas.
Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, 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, for 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, 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.

C. 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.

D. 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 long 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.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least

1 inch, and seal joints with flashing sealant. C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands. D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FINISHES

A. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL A. Perform tests and inspections. B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Cellular Glass: 1 inch thick.

B. Exposed sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be one of the following:

1. Flexible Elastomeric: 1/2 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE A. Domestic Water Piping: Insulation shall be [one of] the following:

1. Cellular Glass: 2 inches thick.
2. Flexible Elastomeric: 2 inches thick.

3.13 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option. C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. PVC: 20 mils thick.

3.14 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option. C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. Aluminum, Stucco Embossed: 0.016 inch thick.

END OF SECTION 22 07 19

SECTION 22 11 16 DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report. B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper. B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings. D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
E. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.

4. Solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. B. Flux: ASTM B 813, water flushable.
C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general- duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS A. General Requirements:
1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Piping Specialties Products. c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc.; a Sensus company. g. Viking Johnson.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company; member of the Phoenix Forge Group. b. Central Plastics Company.
c. Hart Industries International, Inc. d. Jomar International.
e. Matco-Norca.
f. McDonald, A. Y. Mfg. Co.
g. Watts; a division of Watts Water Technologies, Inc. h. Wilkins; a Zurn company.

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company; member of the Phoenix Forge Group. b. Central Plastics Company.
c. Matco-Norca.
d. Watts; a division of Watts Water Technologies, Inc. e. Wilkins; a Zurn company.

2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 125 psig minimum at 180 deg F.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc. b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Non-conducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with

requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
F. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb. G. Install piping concealed from view and protected from physical contact by building occupants
unless otherwise indicated and except in equipment rooms and service areas.

H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping to permit valve servicing.

K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

L. Install piping free of sags and bends.

M. Install fittings for changes in direction and branch connections.

N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
O. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

P. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 22 05 19 "Meters and Gages for Plumbing Piping."

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube.
Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings. C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers. b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers. B. Support vertical piping and tubing at base and at each floor.
C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Re-inspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for re-inspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.
C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:
1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type K; cast- or wrought-copper, solder-joint fittings; and soldered joints.
2. PVC, Schedule 40; socket fittings; and solvent-cemented joints.

E. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.

F. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 shall be the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.

3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

SECTION 22 13 16 SANITARY WASTE & VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water .

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: Schedule 40, ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Solvent Cement: ASTM D 2564.

1. 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).

2.3 SPECIALTY PIPE FITTINGS A. Transition Couplings:
1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

3. Shielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company; a division of MCP Industries, Inc.

b. Standard: ASTM C 1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

4. Pressure Transition Couplings:
a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cascade Waterworks Mfg. Co.
2) Dresser, Inc.
3) EBAA Iron, Inc.
4) JCM Industries, Inc.
5) Romac Industries, Inc.
6) Smith-Blair, Inc.; a Sensus company.
7) The Ford Meter Box Company, Inc.
8) Viking Johnson.

b. Standard: AWWA C219.
c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
d. Center-Sleeve Material: Manufacturer's standard.
e. Gasket Material: Natural or synthetic rubber.
f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Hart Industries International, Inc.
4) Jomar International Ltd.
5) Matco-Norca, Inc.
6) McDonald, A. Y. Mfg. Co.
7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
8) Wilkins; a Zurn company.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 125 psig minimum at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Matco-Norca, Inc.
4) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
5) Wilkins; a Zurn company. b. Description:
1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: 125 psig minimum at 180 deg F.
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Advance Products & Systems, Inc.
2) Calpico, Inc.
3) Central Plastics Company.
4) Pipeline Seal and Insulator, Inc.

b. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: 150 psig.
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel backing washers. PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction
loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
E. Install piping to permit valve servicing.
F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections. I. Install piping to allow application of insulation.
J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install aboveground PVC piping according to ASTM D 2665 and Section 3.1(B) of this Specification.

N. Install underground PVC piping according to ASTM D 2321.

O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 00 50 "Basic Mechanical Materials and Methods."

3.2 JOINT CONSTRUCTION

A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.3 SPECIALTY PIPE FITTING INSTALLATION A. Transition Couplings:
1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:

a. NPS 1-1/2 and Smaller: Fitting-type transition couplings. b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.4 VALVE INSTALLATION

A. General valve installation requirements are specified in Section 22 05 23 "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
2. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers. b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling. C. Support vertical piping and tubing at base and at each floor.
D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.

F. Install supports for vertical PVC piping every 48 inches.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials. Coordinate with civil site plans.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Install horizontal backwater valves with cleanout cover flush with floor.
6. Comply with requirements for backwater valves, cleanouts and drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
7. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent- stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated. B. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings. C. Aboveground, vent piping NPS 4 and smaller shall be the following:
1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings. D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:
1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; cast-iron hubless-piping couplings; and coupled joints.
3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 22 13 16

SECTION 23 05 29 HANGERS & SUPPORTS FOR HVAC PIPING & EQUIPMENT

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7 and local building code.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Show fabrication and installation details for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to
AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and
Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS A. Carbon-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U- bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe. D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon- steel shapes.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength. PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69 or as listed herein, whichever is most limiting. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

1. Horizontal steel pipe and copper tube 1 1/2" diameter and smaller: support on 6 foot centers.

2. Horizontal steel pipe and copper tube over 1 1/2" diameter: support on 10 foot centers.

3. Vertical steel pipe and copper tube: support at alternate floors.
4. Plastic pipe: support in accordance with manufacturer's recommendations.

5. Horizontal cast iron pipe inside building: support each length of pipe (at the joint).

6. Vertical cast iron pipe: support at each floor and at the base.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or

install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping. D. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic 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. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:
1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts of length at least as long as protective shield.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth. C. Provide lateral bracing, to prevent swaying, for equipment supports.
D. Concrete housekeeping bases will be provided as work of Division 03. Furnish to Contractor scaled layouts of all required bases, with dimensions of base, and location to column center lines. Furnish templates, anchor bolts, and accessories necessary for base construction.

E. Provide concrete housekeeping bases for all floor mounted equipment furnished as part of the work of Division 23. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
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/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with 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 no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils

B. Touchup: Clean and touchup paint of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.

2. Adjustable, Steel Band Hangers (MSS Type 7):For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
3. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
4. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
5. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
6. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
7. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system
Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system
Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

a. Light (MSS Type 31): 750 lb.
b. Medium (MSS Type 32): 1500 lb.
c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

M. Saddles and Shields:Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

SECTION 23 05 53 IDENTIFICATION FOR HVAC PIPING & EQUIPMENT

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Stencils.

1.3 ACTION SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors. C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
1. Material and Thickness: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. 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.
4. Fasteners: Stainless-steel rivets or self-tapping screws.

B. Label Content: Include equipment's Drawing designation or unique equipment number,Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Aluminum.
2. Stencil Paint: Exterior, gloss, black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, in colors according to ASME A13.1 unless otherwise indicated.

PART 3 - EXECUTION

3.1 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.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment. B. Locate equipment labels where accessible and visible.

3.3 DUCT LABEL INSTALLATION

A. Stenciled Duct Label: Stenciled labels, showing service and flow direction.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of
50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 23 05 53

SECTION 230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau. C. TAB: Testing, adjusting, and balancing.
D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB
strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.
B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB

reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air
Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable) PART 3 - EXECUTION
3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine operating safety interlocks and controls on HVAC equipment.

J. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Equipment and duct access doors are securely closed.
3. Balance dampers are open.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 07 13 "Duct Insulation"

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements. D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

E. Verify that motor starters are equipped with properly sized thermal protection. F. Check dampers for proper position to achieve desired airflow path.
G. Check for airflow blockages.

H. Check condensate drains for proper connections and functioning. I. Check for proper sealing of air-handling-unit components.
J. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.
4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

3.8 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

a. Indicated versus final performance. b. Notable characteristics of systems.
c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.

13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

a. Settings for outdoor-, return-, and exhaust-air dampers.
b. Fan drive settings including settings and percentage of maximum pitch diameter. c. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Position of balancing devices.

3.10 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 31 13 METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports. B. Related Sections:

1. Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 23 33 00 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in
ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.

4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets. c. Speakers.
d. Sprinklers.
e. Access panels. B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and
Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct- support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lindab Inc.
b. McGill AirFlow LLC. c.SEMCO Incorporated.
d. Sheet Metal Connectors, Inc.
e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements,

materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

C. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.

5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer. E. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
C. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
2. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and
Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths. D. Install ducts with fewest possible joints.
E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers.
Comply with requirements in Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.
Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and

Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and
Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air
Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 START UP

A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and
Balancing for HVAC."

3.7 DUCT SCHEDULE A. Exhaust Ducts:
1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg. b. Minimum SMACNA Seal Class: A

B. Intermediate Reinforcement:

1. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Match duct material.

2. Aluminum Ducts: Aluminum. C. Elbow Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:
1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately

fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated. c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

D. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry. b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees."

a. Velocity 1000 fpm or Lower: 90-degree tap. b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 233423 HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations. B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. 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 Installers of the items involved:

Ceiling suspension assembly members.
1. Size and location of initial access modules for acoustical tile.
2. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set(s) for each belt-driven unit.

1.8 QUALITY ASSURANCE

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

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the
AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.9 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of equipment supports, and wall penetrations with actual equipment provided.
PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FANS

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

1. Penn Barry
2. Greenheck Fan Corporation.
3. Loren Cook Company.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub. F. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using restrained elastomeric mounts having a static deflection of 1 inch.

1. Secure vibration controls to concrete bases using anchor bolts cast in concrete base. C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
D. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch.

E. Install units with clearances for service and maintenance.

F. Label units according to requirements specified in Section 23 05 53 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 23 33 00 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance. C. Ground equipment according to Division 26
D. Connect wiring according to Division 26.

3.3 FIELD QUALITY CONTROL A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and those connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation. B. Adjust belt tension.
C. Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow. E. Lubricate bearings.

END OF SECTION 23 34 23

SECTION 316219 TIMBER PILES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes round timber piles.

1.2 UNIT PRICES

A. Contract Sum: Base Contract Sum on number and dimensions of piles indicated from tip to cutoff, plus not less than 12 inches of overlength for cutting piles at cutoff elevations.

B. Work of this Section is affected as follows:

1. Additional payment for pile lengths in excess of that indicated, and credit for pile lengths less than that indicated, is calculated at unit prices stated in the Contract, based on net addition or deduction to total pile length as determined by Architect and measured to nearest 12 inches.

a. Additional payment for splices required to extend pile lengths in excess of that indicated is calculated at unit prices stated in the Contract.
2. Unit prices include labor, materials, tools, equipment, and incidentals for furnishing, driving, cutting off, capping, and disposing of cutoffs.
3. Test piles that become part of permanent foundation system are considered as an integral part of the Work.
4. No payment is made for rejected piles, including piles driven out of tolerance, defective piles, or piles damaged during handling or driving.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For timber piles. Show fabrication and installation details for piles, including details of driving shoes, tips or boots, and pile butt protection.
1.5 INFORMATIONAL SUBMITTALS A. Round timber pile treatment data.
B. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and, type, size, and properties of hammer cushion.

C. Pile-driving records.

D. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle and store piles at Project site to prevent breaks, cuts, abrasions, or other physical damage and as required by AWPA M4. Do not drill holes or drive spikes or nails into pile below cutoff elevation.

PART 2 - PRODUCTS

2.1 TIMBER PILES

A. Round Timber Piles: ASTM D 25, unused, clean peeled, one piece from butt to tip; of the following species and size basis:

1. Species: Southern yellow pine.
2. Size Basis: 8-inch tip and natural taper.

B. Pressure-treat round timber piles according to AWPA U1 as follows:

1. Service Condition: UC4C Ground Contact, Extreme Duty
2. Treatment: Waterborne preservative Chromated Copper Arsenate (CCA) must be used. No exceptions taken.

2.2 PILE ACCESSORIES

A. Driving Shoes: Fabricate from ASTM A 1011/A 1011M, hot-rolled carbon-steel strip to suit pile-tip diameter.

2.3 FABRICATION

A. Pile Tips: Cut and shape pile tips to accept driving shoes. Fit and fasten driving shoes to pile tips according to manufacturer's written instructions.
B. Pile Butt: Trim pile butt and cut perpendicular to longitudinal axis of pile. Chamfer and shape butt to fit tightly to driving cap of hammer.

C. Field-Applied Wood Preservative: Treat field cuts, holes, and other penetrations according to AWPA M4.

D. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch intervals; label the distance from pile tip at 60-inch intervals. Maintain markings on piles until driven.

PART 3 - EXECUTION

3.1 DRIVING PILES

A. General: Continuously drive piles to elevations or penetration resistance indicated.

Establish and maintain axial alignment of leads and piles before and during driving.

B. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.

C. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:

1. Location: 4 inches from location indicated after initial driving, and 6 inches after pile driving is completed.
2. Plumb: Maintain 1 inch in 48 inches from vertical, or a maximum of 4 inches, measured when pile is aboveground in leads.
3. Batter Angle: Maximum 1 inch in 48 inches from required angle, measured when pile is aboveground in leads.

D. Withdraw damaged or defective piles and piles that exceed driving tolerances, and install new piles within driving tolerances. Fill holes left by withdrawn piles as directed by Architect.

E. Cut off butts of driven piles square with pile axis and at elevations indicated.

1. Cover cut-off piling surfaces with minimum three coats of preservative treatment according to AWPA M4.

F. Pile-Driving Records: Maintain accurate driving records for each pile, compiled and attested to by a qualified professional engineer.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections. B. Tests and Inspections:

1. Dynamic Pile Testing: High-strain dynamic monitoring shall be performed and reported according to ASTM D 4945 during initial driving and during restriking on five single piles.

END OF SECTION 316219