

BID DOCUMENTS
FOR
TERMINAL
EXPANSION PROJECT
June 21, 2019

Volume II

**NORTHWEST FLORIDA BEACHES
INTERNATIONAL AIRPORT (ECP)**



NORTHWEST FLORIDA
BEACHES INTERNATIONAL AIRPORT

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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JANUARY 29, 2019
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SECTION 03 31 00 - CAST-IN-PLACE CONCRETE

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 specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - a. Footings.
 - b. Foundation walls.
 - c. Slabs-on-grade.
 - d. Building frame members.
- B. Related Sections include the following:
 - a. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement ASTM C150 Type I/II, **No fly ash is permitted on the project.**

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - a. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - a. Aggregates.

E. Material Certificates: For each of the following, signed by manufacturers:

- a. Cementitious materials.
- b. Admixtures.
- c. Steel reinforcement and accessories.
- d. Waterstops.
- e. Curing compounds.
- f. Bonding agents.
- g. Adhesives.
- h. Vapor retarders.
- i. Semirigid joint filler.
- j. Joint-filler strips.

F. Field quality-control test and inspection reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - a. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
 - b. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

- a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
- b. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - a. Plywood, metal, or other approved panel materials.
 - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - i. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, $\frac{3}{4}$ by $\frac{3}{4}$ inch (19 by 19 mm), minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - a. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - a. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - b. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - c. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, A616 Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, A616 Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless steel bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - a. Portland Cement: ASTM C 150, Type I/II.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded.
 - a. Maximum Coarse-Aggregate Size:
 - i. 3/4" maximum unless noted.
- C. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - a. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - b. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - c. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

2.7 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
- B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

2.8 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 6 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1,
- B. Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:
 - a. ASTM C 1315, Type 1, Class A.

2.10 ELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semi rigid Joint Filler: Two-component, semi rigid, 100 percent solids, per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.
- E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - a. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - a. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability and as specified on drawings and schedules.
 - b. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - c. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion normal-weight concrete mixture as follows:
 - a. Minimum Compressive Strength:

- i. Pier Footings 3000 psi at 28 days.
 - ii. Wall Footings 4500 psi at 28 days.
 - iii. Slab on Grade 4500 psi at 28 days.
- b. Maximum Water-Cementitious Materials Ratio: 0.51.
- c. Slump Limit: 3” to 6”
- d. Air Content: 5 percent, plus or minus 1.5 percent at point of delivery for $\frac{3}{4}$ inch nominal maximum aggregate size.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI’s “Manual of Standard Practice.”

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
- B. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - a. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 - b. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - a. Install keyways, reglets, recesses, and the like, for easy removal.
 - b. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.

- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - a. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - b. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - a. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - b. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation, and removal of shoring and reshoring.

3.5 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - a. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

- a. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - a. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - a. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - a. Place joints perpendicular to main reinforcement. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - b. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - c. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - a. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - b. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - a. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 - b. Terminate full-width joint-filler strips not less than ½ inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 7 Section “Joint Sealants,” are indicated.
 - c. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.8 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer’s written instructions.

- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - a. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - a. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - b. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - c. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - a. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - b. Maintain reinforcement in position on chairs during concrete placement.
 - c. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - d. Slope surfaces uniformly to drains where required.
 - e. Begin initial floating using bull floats or darbies to form a uniform and open textured surface plane, before excess bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - a. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

- c. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - a. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement.
 - b. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - c. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete.
 - d. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - a. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed 1/8 inch in height.
 - a. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
 - a. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of ¼ inch (6 mm) in 1 direction.
 - a. Apply scratch finish to surfaces indicated and to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - a. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sandbed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - a. Apply a trowel finish to surfaces indicated, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - b. Finish surfaces to the following tolerances:
 - a. Finish and measure surface so gap at any point between concrete surface and an unveled, freestanding, 10-foot- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch (4.8 mm).
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - a. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - a. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive aluminum granule finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 - a. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aluminum granules over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
 - b. After broadcasting and tamping, apply float finish.
 - c. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - a. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - i. Water.
 - ii. Continuous water-fog spray.
 - iii. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 - b. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - i. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - ii. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - iii. Cure concrete surfaces to receive floor coverings with either a moisture retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - c. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

- i. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
- d. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - a. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas as approved by Architect.
 - a. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - a. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½ inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill formtie voids with patching mortar or cone plugs secured in place with bonding agent.
 - b. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - c. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - a. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or

that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

- b. After concrete has cured at least 14 days, correct high areas by grinding.
 - c. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - d. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - e. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of ¼ inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - f. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a ¾-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - g. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineers' approval.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - a. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - b. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
 - i. When frequency of testing will provide fewer than five compressive strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

- c. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - d. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - e. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - f. Compression Test Specimens: ASTM C 31/C 31M.
 - i. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - g. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory cured specimens at 7 days and one set of two specimens at 28 days.
 - i. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - ii. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 - 1. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - 2. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 - 3. Test results shall be reported in writing to Architect, Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 - h. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
 - i. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 - a. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - b. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Measure floor and slab flatness and levelness within 24 hours of finishing. Report to contractor results within 48hrs.

END OF SECTION

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 05 12 00 - STRUCTURAL STEEL

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. Section Includes:
 - B. Structural steel.
 - C. Grout.
 - D. Related Sections:
 - 1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Division 5 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. Reproduction & Reuse of contract documents for the purpose of preparing shop drawings is strictly prohibited.
- C. Qualification Data: For qualified Installer and fabricator.
- D. Welding certificates.
- E. Mill test reports for structural steel, including chemical and physical properties.
- F. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Shop primers.
 - 3. Nonshrink grout.
- G. Source quality-control reports.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
- B. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
- B. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
- D. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
- E. Clean and relubricate bolts and nuts that become dry or rusty before use.

1.7 COORDINATION

- A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M, 50 ksi.
- B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 - 1. Weight Class: As Indicated.
 - 2. Finish: Black.
- F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
- B. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: As Indicated.
 - 2. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 5. Finish: Plain
- C. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 4. Finish: Plain
- D. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened ASTM A 36/A 36M carbon steel.
- E. Finish: Plain

2.3 PRIMER

- A. Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.
- B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning." All Steel except where noted otherwise.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 1. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 2. Ultrasonic Inspection: ASTM E 164.
 3. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations and elevations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

- B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 05 31 00 - STEEL DECK

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. Roof deck.
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. Product Certificates: For each type of steel deck, signed by product manufacturer.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
 - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

- D. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 METAL DECK

- A. Steel Roof Deck:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230) G60 (Z180) zinc coating.
 - 2. Deck Profile: Type n
 - 3. Profile Depth: 3 inches (38 mm).
 - 4. Thickness: 18 ga.
 - 5. Span Condition: single.
 - 6. Side Laps: Overlapped.

2.2 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws. Fasteners for securing roof deck shall have a 0.40-inch diameter head or shall have an equivalent washer.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Galvanizing Repair Paint: ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Locate deck bundles to prevent overloading of supporting members.
- C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 DECK INSTALLATION

- A. Fasten deck panels to steel supporting members and perimeter edges as indicated on drawings.
- B. Side-Lap Fastening: Fasten side laps of panels between supports, at intervals noted on drawings, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped 2 inches (51 mm) minimum.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.
 - 1. Mechanically fasten cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
 - a. **As a minimum install 14 ga 12" wide ridge liners at all conditions.**
- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of deck immediately after installation, and apply galvanizing repair paint.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-I Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Work described in this Section includes galvanized steel stud framing systems, and any heavy gauge steel joists and steel rafters indicated, and for use at any new exterior metal stud walls and framing, interior and exterior load-bearing walls, and other locations as indicated on drawings.

1.3 QUALITY ASSURANCE:

- A. **Component Design:** Calculate structural properties of studs and joists in accordance with the more stringent requirements of the American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members", and their co-sponsored publication "Prescriptive Method for Residential Cold-Formed Steel Framing".
- B. **Welding:** Use qualified welders and comply with American Welding Society (AWS) DU, "Structural Welding Code -Sheet Steel."
- C. **Fire Rated Assemblies:** Where framing units are components of assemblies indicated for a fire - resistance rating, including those that have been approved by governing authorities that have jurisdiction.
- D. **Pre-Installation Conference:** Prior to start of installation of metal framing systems, meet at project site with installers of other work including door and window frames and mechanical and electrical work.

1.4 SUBMITTALS:

- A. **General:** Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
 - 1. Product data and installation instructions for each item of cold-formed metal framing and accessories.
 - 2. Shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data.
 - 3. Include placing drawings for joists, ceiling, roof related and supplemental and/or related framing system members showing size and gauge designations, number, type, location, and spacing. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

4. Include detailed design drawings for headers, including size and gauge designations, locations, assemblies, bearing, anchorage, etc.
5. Shop drawings shall bear the current signed and dated Florida seal and license number of the manufacturer's and/or fabricator's Design Engineer responsible for their design and preparation.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Comply with manufacturer's current written instructions and recommendations.
- B. Protect metal framing units from rusting and damage.
- C. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.
- D. Store off ground in a dry ventilated space or protect with breathable waterproof tarpaulins.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Subject to compliance with requirements.

2.2 METAL FRAMING:

- A. System Components: With each type of metal framing and headers required, provide manufacturer's standard steel runners (tracks), blocking, bridging, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete metal framing system.
- B. Materials and Finishes:
 1. For 16-gauge and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 40,000 psi; ASTM A 446, A 570, or A 611.
 2. For 18-gauge and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A 611.
 3. Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G60 coating. F
 4. Finish of installation accessories to match that of main framing components, unless otherwise indicated.
- C. "C"-Shape Studs: Manufacturer's standard load-bearing steel studs of size, shape, and gauge indicated, with 1.625-inch flange and flange return lip.
- D. Track: Unless otherwise indicated or required by project conditions, fire-ratings, etc., provide manufacturer's standard Deep Leg Tracks, un-punched unless otherwise indicated, of size, shape and gauge, indicated, with minimum 1-5/8-inch flange.
- E. Deflection Track -Typical at Stud Walls Up To Slab or Similar Fixed Structure at Top of Walls: Provide for no less than 1" of vertical movement
- F. Stud Wall Bridging: 1-1/2-inches x 16-gauge Cold Rolled Channel, unless otherwise indicated, anchored to each stud with 16-gauge clip angles, or welded connections (where allowed by manufacturer), and 16-gauge splice plates, with spacing at 4' -0" or 4' -6" o.c. vertically, through pre-punched slots in studs.
- G. Solid Joist Bridging: 1-5/8-inches x same gauge and depth as joists, unless otherwise indicated, anchored to joists webs with 2-inch x 2-inch x 16-gauge clip angles, or welded with continuous

rows spaced at mid-span minimum, or 5' -0" o.c. maximum at clear span where span exceeds 10'-0".

- H. Fasteners: Provide self-drilling, self-tapping #10 sheet metal screws and bolts; threaded studs and expansion shields as required for framing.
- I. Electrodes for Welding: Comply with AWS Code.
- J. Galvanizing Repair Paint: High zinc dust content paint for repair of galvanized surfaces damaged by welding, complying with ASTM A 780.

2.3 FABRICATION:

- A. General: Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.
- B. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.
- C. Fastenings: Attach similar components by welding or screws.
- D. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- E. Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8-inch in 10 feet
- F. Headers: Form from at least two equal size C-shapes in a back-to-back or box type configuration.

PART 3 - EXECUTION

3.1 INSTALLATION -GENERAL:

- A. Manufacturer's Instructions: Install metal framing system in accordance with manufacturer's current printed or written instructions and recommendations, unless otherwise indicated.
- B. Runner Tracks:
 - 1. Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks at all walls anchored to concrete floor and roof structure as indicated.
 - 2. Track shall be spliced with channel insert fastened with two (2) sheet metal screws, bolts or rivets at each side, each flange, and each corner. Provide fasteners at corners and ends of tracks.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners and bridging to supporting structure.
- E. Install supplemental framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- F. Erection Tolerances: Bolt or weld panels (at both horizontal and vertical junctures) to produce flush, even, true to line joints. 1/16" out of plane max.

3.2 REPAIRS AND PROTECTION:

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 05 50 00 - METAL FABRICATIONS

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. Loose bearing and leveling plates.
 2. Loose steel lintels.
 3. Steel framing and supports for mechanical and electrical equipment.
 4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 5. Metal angle corner guards.
 6. Metal edgings.
 7. Metal stairs.

1.3 SUBMITTALS

- A. Product Data: For the following:
 1. Paint products.
 2. Grout.
- B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 1. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Welding Certificates: Copies of certificates for welding procedures and personnel.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- E. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- F. Malleable-Iron Castings: **ASTM A 47, Grade 32510** (ASTM A 47M, Grade 22010).
- G. Gray-Iron Castings: **ASTM A 48, Class 30** (ASTM A 48M, Class 200), unless another class is indicated or required by structural loads.
- H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either **ASTM A 47 (ASTM A 47M)** malleable iron or **ASTM A 27/A 27M** cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per **ASTM A 153/A 153M**.

I. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 ALUMINUM

A. Aluminum Extrusions: **ASTM B 221 (ASTM B 221M)**, alloy 6063-T6.

2.4 PAINT

A. Shop Primer for Ferrous Metal (Interior Use): Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Shop Primer for Ferrous Metal (Exterior Use): Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.

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

- a. Carboline 621; Carboline Company.
- b. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.
- c. Tneme-Zinc 90-97; Tnemec Company, Inc.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, **ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6)**; with hex nuts, **ASTM A 563 (ASTM A 563M)**; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: **ASME B18.6.3 (ASME B18.6.7M)**.

E. Lag Bolts: **ASME B18.2.1 (ASME B18.2.3.8M)**.

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, **ASME B18.22.1 (ASME B18.22M)**.

- H. Lock Washers: Helical, spring type, carbon steel, **ASME B18.21.1 (ASME B18.21.2M)**.
- I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with **ASTM F 593 (ASTM F 738M)** and nuts complying with **ASTM F 594 (ASTM F 836M)**.
- J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.6 GROUT

- A. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
 - 1. Use for interior unexposed areas only.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 CONCRETE FILL

- A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of **3000 psi (20 MPa)**, unless otherwise indicated.

2.8 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Shear and punch metals cleanly and accurately. Remove burrs.
- C. Ease exposed edges to a radius of approximately **1/32 inch (1 mm)**, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
 - G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
 - H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 - I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
 - J. Remove sharp or rough areas on exposed traffic surfaces.
 - K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- 2.9 LOOSE BEARING AND LEVELING PLATES
- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- 2.10 LOOSE STEEL LINTELS
- A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
 - B. Weld adjoining members together to form a single unit where indicated.
 - C. Galvanize loose steel lintels located in exterior walls.
- 2.11 SHELF ANGLES
- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.
- C. Galvanize shelf angles to be installed in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.12 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports indicated and as necessary to complete the Work.
- B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors **1-1/4 inches (32 mm)** wide by **1/4 inch (6 mm)** thick by **8 inches (200 mm)** long at **24 inches (600 mm)** o.c., unless otherwise indicated.
 - 2. Furnish inserts if units must be installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports exposed to exterior or part of exterior wall construction.

2.13 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than **6 inches (150 mm)** from each end, **6 inches (150 mm)** from corners, and **24 inches (600 mm)** on center, unless otherwise indicated.
- C. Galvanize miscellaneous steel trim in the following locations:
 - 1. Exterior.
 - 2. Interior, where indicated.

2.14 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.15 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.16 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.17 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:

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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 SETTING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 05 52 13- PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Aluminum pipe and tube railings.

1.2 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of **50 lbf/ ft.** applied in any direction.
 - b. Concentrated load of **200 lbf** applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Top Rails of Guards:
 - a. Uniform load of **50 lbf/ ft.** applied in any direction **50 lbf/ ft.** applied horizontally and concurrently with **100 lbf/ ft.** applied vertically downward
 - b. Concentrated load of **200 lbf** applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 3. Infill of Guards:
 - a. Concentrated load of **50 lbf** applied horizontally on an area of **1 sq. ft.**
 - b. Uniform load of **25 lbf/sq. ft.** applied horizontally.
 - c. Infill load and other loads need not be assumed to act concurrently.

- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F ambient; 180 deg F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of finishing and connecting members at intersections.
- E. Welding certificates.
- F. Qualification Data: For professional engineer .
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2, "Structural Welding Code--Aluminum."

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 - 2. Provide allowance for trimming and fitting at site.

1.6 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Aluminum Pipe and Tube Railings:
 - a. AlumaGuard Corp.
 - b. ATR Technologies, Inc.
 - c. Blum, Julius & Co., Inc.
 - d. Braun, J. G., Company; a division of the Wagner Companies.

- e. CraneVeyor Corp.
- f. Hollaender Manufacturing Company.
- g. Moultrie Manufacturing Company.
- h. Pisor Industries, Inc.
- i. Sterling Dula Architectural Products, Inc.
- j. Superior Aluminum Products, Inc.
- k. Thompson Fabricating, LLC.
- l. Tubular Specialties Manufacturing, Inc.
- m. Tuttle Aluminum & Bronze.
- n. Wagner, R & B, Inc.; a division of the Wagner Companies.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6063-T6.
 - 1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.
- C. Drawn Seamless Tubing: **ASTM B 210** (ASTM B 210M), Alloy 6063-T832.
- D. Plate and Sheet: **ASTM B 209** (ASTM B 209M), Alloy 6061-T6.
- E. Die and Hand Forgings: **ASTM B 247** (ASTM B 247M), Alloy 6061-T6.
- F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.4 FASTENERS (As Needed)

- A. General: Provide the following:
 - 1. Aluminum Railings: Type 304 or 316 stainless-steel fasteners.

- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Anchors: Provide cast-in-place or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.5 MISCELLANEOUS MATERIALS (As Needed)

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately $1/32$ inch otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

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 flux immediately.
 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form changes in direction as follows:
1. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- L. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is **1/4 inch (6 mm)** or less.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

- Q. For railing posts set in concrete, provide sleeves not less than **6 inches (150 mm)** long with inside dimensions not less than **1/2 inch (13 mm)** greater than outside dimensions of post, with steel plate forming bottom closure.
- R. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

2.7 FINISHES, GENERAL

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

2.8 ALUMINUM FINISHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of **1/16 inch in 3 feet**.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed **1/4 inch in 12 feet**.
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending **2 inches (50 mm)** beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within **6 inches (150 mm)** of post.

3.4 ANCHORING POSTS (OPTIONAL)

- A. Use pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink,

nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- D. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch (3-mm) buildup, sloped away from post.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using nonwelded connections.

3.6 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Use type of bracket with predrilled hole for exposed bolt anchorage.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed gypsum board plaster partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

3.7 ADJUSTING AND CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

3.8 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 52 13

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board. (Roof)
2. Kraft-faced Glass-Fiber Blanket

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristic: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by U L or another testing and inspection agency acceptable authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 1. Surface-Burning Characteristics: ASTM E 84.
 2. Fire-Resistance Rating: ASTM E 119.
 3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

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

- B. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD (Roof Insulation)

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.
- B. Extruded Polystyrene Board, Type IV ASTM C 578, Type IV, **25-psi (173-kPa)** minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84. Thickness as required for minimum R-30.
1. Manufacturers: Subject to compliance with the requirements. Manufacturers offering products that may be incorporated into the work, include but are not limited to, one of the following:
 - a. DOW Chemical Company
 - b. Owens Corning
 - c. Firestone Building Products
 - d. Atlas Roofing
 - e. Johns Manville
 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an improved assembly.
 3. Anchor per manufacturer's recommendations for specified wind loads.

2.2 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Kraft Faced: ASTM C 665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation), Category 1 (membrane is a vapor barrier). Thickness to match wall depth. See Construction Drawings for minimum R-Value.
1. Manufacturers: Subject to compliance with the requirements. Manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
 - a. Certain Teed Corporation
 - b. Guardian Fiberglass
 - c. Johns Manville
 - d. Knauf Fiber Class

- e. Owens Corning

2.3 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - 1. Manufacturers: Subject to compliance with the requirements. Manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
 - a. AGM industries, Inc. Series T TACTOO Insol-Hangers.
 - b. Eckel Industries of Canada; Stic-Klip, Type N Fasteners.
 - c. Genco; Spindle Type
 - 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - 1. Products:
 - a. Basis of Design: Gemco; 90-Degree Insulation Hangers.
 - 2. Angle: Formed from 0.030-inch- thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
 - 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
 - 1. Provide one of the following (but not limited to):
 - a. AGM Industries, Inc.; RC150
 - b. AGM industries, Inc.; SC150
 - c. Gemco; Dome Cap
 - d. Gemco; R-150
 - e. Gemco; S-150
 - 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Crawl spaces.
 - b. Ceiling plenums.
 - c. Attic spaces.
- D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. For preformed insulating units, provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarder, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, use units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain **3-inch** clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed **96 inches**, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings and seal each continuous area of insulation to ensure airtight installation.
 - a. Set units with facing placed toward warm in winter side of Construction, unless otherwise indicated.
- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.4 PROTECTION

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

END OF SECTION 07 21 00

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured through-wall flashing with counterflashing.
2. Manufactured reglets with counterflashing.
3. Formed roof-drainage sheet metal fabrications.
4. Formed roof sheet metal fabrications.
5. Formed wall sheet metal fabrications.

1.2 COORDINATION

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

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 - 8. Include details of roof-penetration flashing.
 - 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 10. Include details of special conditions.
 - 11. Include details of connections to adjoining work.

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof edge/eave, including, but not limited to built-in gutter, fascia, fascia trim, apron flashing approximately **10 feet** long, including supporting construction cleats, seams, attachments, underlayment, and accessories.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings/roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 1. Design Pressure: As indicated on Drawings

- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F (67 deg C), ambient; material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275)]; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
1. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides
 2. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 3. Color: As selected by Architect from manufacturer's full range.
 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
1. Products: Subject to compliance with permits, products that may be incorporated into the work include, but are not limited to, the following:
 - a. CCW W IP 300 HT
 - b. Grace Construction Products, a unit of W. R. Grace & Company; Ultra
 - c. Henry Company; Blueskin PE200HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment

2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.
3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.

C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS (As Needed)

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 3. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at **3-inch (75-mm)** intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with interlocking counterflashing on exterior face, of same metal as flashing.

2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of **1/4 inch in 20 feet (6 mm in 6 m)** on slope and location lines indicated on Drawings and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Use lapped expansion joints only where indicated on Drawings.
 - 2. Form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with butyl sealant concealed within joints where lapped expansion provisions cannot be used.
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

- H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- I. Do not use graphite pencils to mark metal surfaces.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch/maximum 12 ft. long sections. Furnish flat-stock gutter brackets, gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 - 1. Gutter Profile: Match existing adjacent buildings according to cited sheet metal standard.
 - 2. Expansion Joints: Lap type, Butt type.
 - 3. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
 - 4. Fabricate from the following materials:
 - a. Aluminum: 0.063 inch thick.
- B. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from one of the following materials:
 - 1. Aluminum: 0.032 inch thick.
 - 2. Galvanized Steel: 0.028 inch (0.71 mm).
 - 3. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than **2 inches**.
- B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than **6 inches** staggered **24 inches** between courses. Overlap side edges not less than **3-1/2 inches**. Roll laps and edges with roller. Cover underlayment within 14 days.
- C. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners[, solder], protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than **12 inches (300 mm)** apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
 - 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of **10 feet** with no joints within **24 inches** of corner or intersection.

1. Use lapped expansion joints only where indicated on Drawings.
 2. Form expansion joints of intermeshing hooked flanges, not less than **1 inch** deep, filled with sealant concealed within joints where lapped expansion provisions cannot be used.
- D. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than **1 inch** into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between **40 and 70 deg F**, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below **40 deg F (4 deg C)**.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of **1-1/2 inches (38 mm)**; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder aluminum sheet.
 2. Do not use torches for soldering.
 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- F. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
- C. Downspouts: Join sections with **1-1/2-inch (38-mm)** telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately **60 inches (1500 mm)** o.c.
 2. Provide elbows at base of downspout to direct water away from building.
 3. Connect downspouts to underground drainage system.
- D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of **4 inches (100 mm)** in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered **3-inch** centers.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of **1/4 inch in 20 feet** on slope and location lines indicated on Drawings and within **1/8-inch** offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - d. Control and expansion joints in ceilings and other overhead surfaces.
 - e. Other joints as needed.
 - 2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of interior unit masonry or concrete walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors or windows.
 - f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - g. Other joints as needed.
 - h. Control and expansion joints in tile flooring.
 - i. Where acoustical doing feelings are indicated.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

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

- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- D. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 PROJECT CONDITIONS

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

1.6 WARRANTY

- 1. Standard Manufacturers 1 year warranty

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Single-Component Neutral-Curing Silicone Sealant (Exterior and Interior)
 - 1. Products: (But not limited to)
 - a. Dow Corning Corporation; 790.
 - b. GE Silicones; SilPruf LM SCS2700.
 - c. Tremco; Spectrem 1 (Basic).
 - d. GE Silicones; SilPruf SCS2000.
 - e. Pecora Corporation; 864.
 - f. Pecora Corporation; 890.
 - g. Polymeric Systems Inc.; PSI-641.
 - h. Sonneborn, Division of ChemRex Inc.; Omniseal.
 - i. Tremco; Spectrem 3.

2.3 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
 - 1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 2. Products: (but not limited to)
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
 - 1. Products: (but not limited to)
 - a. Pecora Corporation; BA-98.
 - b. Tremco; Tremco Acoustical Sealant.

2.4 PREFORMED JOINT SEALANTS (Where needed)

- A. Preformed Silicone-Sealant System: Manufacturer's standard system consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
 - 1. Products: (but not limited to)
 - a. Dow Corning Corporation; 123 Silicone Seal.
 - b. GE Silicones; UltraSpan US1100.
 - c. Pecora Corporation; Sil-Span.
 - d. Tremco; Spectrem Ez Seal.

2.5 PREFORMED TAPE SEALANTS (Where needed)

- A. Back-Bedding Mastic Tape Sealant: Preformed, butyl-based elastomeric tape sealant with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Tape Sealant: Closed-cell, PVC foam tape sealant; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for applications in which tape acts as the primary sealant.
 - 2. Type 2, for applications in which tape is used in combination with a full bead of liquid sealant.

2.6 JOINT-SEALANT BACKING (Where needed)

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to **minus 26 deg F**. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS (As needed)

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

- b. Glass.
 - c. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- H. Installation of Preformed Tapes: Install according to manufacturer's written instructions.
- I. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than **3/8 inch (10 mm)**. Hold edge of sealant bead **1/4 inch (6 mm)** inside masking tape.
 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- J. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

1. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
2. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - b. Whether sealants filled joint cavities and are free of voids.
 - c. Whether sealant dimensions and configurations comply with specified requirements.
3. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

4. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

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

3.6 PROTECTION

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

END OF SECTION 07 92 00

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

- D. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to NFPA 252 or UL 10B.
- C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
- D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
 - 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements (but not limited to)
 - 1. Amweld Building Products, LLC.
 - 2. Benchmark; a division of Therma-Tru Corporation.
 - 3. Ceco Door Products; an Assa Abloy Group company.
 - 4. Curries Company; an Assa Abloy Group company.
 - 5. Deansteel Manufacturing Company, Inc.
 - 6. Firedoor Corporation.
 - 7. Fleming Door Products Ltd.; an Assa Abloy Group company.
 - 8. Habersham Metal Products Company.
 - 9. Karpen Steel Custom Doors & Frames.
 - 10. Kewanee Corporation (The).
 - 11. Mesker Door Inc.
 - 12. Pioneer Industries, Inc.
 - 13. Security Metal Products Corp.
 - 14. Steelcraft; an Ingersoll-Rand company.
 - 15. Windsor Republic Doors.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 (ZF180) metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 08 Section "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: As indicated on drawings.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - b. Thermal-Rated (Insulated) Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than R-15 when tested according to ASTM C 1363.
 - 1) Locations: Where indicated on drawings.
 - 3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 - a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).
 - 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch (54-mm) radius.
 - 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
 - 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - a. Width: 1-3/4 inches (44.5 mm).
 - b. 16 ga.
- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

- D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Finish: Factory

2.4 STANDARD HOLLOW METAL FRAMES (Doors and Windows)

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Minimum 14 ga. thick steel sheet.
- C. Interior Frames Doors and Windows: Fabricated from cold-rolled steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Frames for Borrowed Lights: Same as adjacent door frame.
 - 3. Minimum 18 ga. thick steel sheet.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
 - 1. Prep for door closer (all locations)
- E. Finish: Factory

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042-inch-thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032-inch-thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032-inch-thick, fabricated from same material as frames in which they are installed.
- D. Terminated Stops: Where indicated on interior door frames, terminate stops 6 inches above finish floor with a 45 or 90-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
 - 1. Provide terminated stops unless otherwise indicated.

2.7 ACCESSORIES (as needed)

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 thick.

2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117, ANSI/NAAMM-HMMA 861.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Glazed Lites: Factory cut openings in doors.
 - 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 beyond edge of door on which astragal is mounted.
- D. HOLLOW METAL FRAMES
 - 1. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
 - 2. Weatherstripped Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated weatherstripped profiles with 1/8" integral kerf formed into the frame soffit able to receive manufacturer's listed gasket material. Available for use in both masonry and drywall construction, with fire rating up to 3 hours complying with NFPA 105, UL 1784, and ASTM E-283 Test criteria.
 - 3. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 - a. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.

- b. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
 - c. Manufacturers Basis of Design:
 - 1) CECO Door Products – SU Series.
 - 2) Curries Company – M Series.
 - 4. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 - a. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 - b. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 - c. Manufacturers Basis of Design:
 - 1) CECO Door Products BQ/BU/DQ/DU/BR/DR Series.
 - 2) CECO Door Products SQ/SU/SR Series.
 - 3) CECO Door Products – Kerfed Weatherstripped DQW/DRW Series.
 - 4) Curries Company C/CM/CG Series.
 - 5) Curries Company M/G Series.
 - 6) Curries Company – Kerfed Weatherstripped WC/WM Series.
 - 5. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
 - 6. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
- 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8, ANSI/NAAMM-HMMA 861.
 - 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
- 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

2.9 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer

manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

- B. Factory Finish: Clean, pretreat and apply manufacturer's standard two-coat, baked on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.
 - 1. Color and Glass: Match Architect's Sample.

2.10 SPECIAL FUNCTION HOLLOW METAL DOORS

- A. Security Door Assemblies: Subject to the same compliance standards and requirements as standard hollow metal doors, provide manufacturer's security door system tested in accordance with ANSI/NAAMM/HMMA 862-87 or 863-98 commercial and detention hollow metal standards. Fabricate with minimum 14-gauge construction, 1¾" thickness, reinforced with 18 gauge steel stiffeners welded to the face sheets every 4" on center with spot welds 4" on center the full height of the door and minimum 10 gauge inverted steel end channels welded to both face sheets. Furnish as a complete unit with factory welded frame.
 - 1. Manufacturers Basis of Design:
 - a. Curries Company 847 Series Frames
 - b. CECO Door Products RestrictDor Series Frames

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11, HMMA 840.
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. Ceiling Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105, UBC Standard 7-2.
- D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Shop priming flush wood doors or Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face. Materials, approximately, 8 by 10 inch, for each material and finish. Provide manufacturers full range of stain colors.
2. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

- B. Source Limitations: Obtain flush wood doors from single manufacturer.
- C. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 - 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10C.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Exterior Doors: Five years from date of Substantial Completion.
4. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, (but not limited to)
 1. Graham; an Assa Abloy Group company.
 2. Haley Brothers, Inc.
 3. Marshfield – Algoma (by Masonite Architectural)
 4. Mohawk Flush Doors, Inc.; a Masonite company.
 5. Oshkosh Architectural Door Company.
 6. Trudoor, LLC.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade:
 1. Heavy Duty unless otherwise indicated.
 2. Extra Heavy Duty: public toilets and janitor's closets.
- C. Structural-Composite-Lumber-Core Doors:
 1. Structural Composite Lumber: WDMA I.S.10
 - a. Screw Withdrawal, Edge: 400 lbf (1780 N).
- D. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 2. Pairs: Provide formed-steel edges and astragals with intumescent seals.
 - a. Finish steel edges and astragals to match door hardware (locksets or exit devices).

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors

1. Grade: Custom (Grade A faces)
2. Species: Select red oak
3. Cut: Plain sliced
4. Match between Veneer Leaves: Pleasing match.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Core: Structural composite lumber Construction: seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
7. WDMA I.S.1-A Performance Grade: Heavy Duty.

B. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

C. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

D. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel or powder coat; and approved for use in doors of fire-protection rating indicated.

2.4 FABRICATION

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

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

B. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Louvers: Factory install louvers in prepared openings.

2.5 PRIMING

- A. Doors for Transparent Finish: Shop prime doors with stain (if required), other required pretreatments, and first coat of finish as specified in Division 09 Section Interior Painting Seal all four edges, edges of cutouts, and mortises with first coat of finish.

2.6 FACTORY FINISHING

- A. Factory Finish Doors.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

- a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

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

END OF SECTION 08 14 16

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 08 43 13 - ALUMINUM-FRAMED STOREFRONTS AND WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storefront framing. (Aluminum Windows)

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

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

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

C. Samples for Initial Selection: For units with factory-applied color finishes.

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

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

- B. Energy Performance Certificates: For aluminum-framed storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed storefront.
- C. Product Test Reports: For aluminum-framed storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed storefronts to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of storefront systems.

1.6 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

- A. Special Warranty: Manufacturer and Installer agrees to repair or replace components of aluminum-framed storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including, but not limited to, excessive deflection.

- b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
- 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Storefront Framing (Aluminum Windows): Subject to compliance with the requirements, manufacturers offering products that may be incorporated in to the work include, but are not limited to, the following:
- 1. Kawneer North America, an Alcoa company. (Basis of Design: Trifab 451T, 2" x 4")
 - 2. EFCO Corporation.
 - 3. TRACO.
 - 4. Vistawall Architectural Products; The Vistawall Group, a Bluescope Steel company.
 - 5. YKK AP America Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design aluminum-framed storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- 1. Aluminum-framed storefronts and windows shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.

- c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
- 1. Wind Loads: As indicated on Structural Drawings.
 - 2. Other Design Loads: As indicated on Structural Drawings.
- D. Energy Performance: Certify and label energy performance according to NFRC as follows:
- 1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.57 Btu/sq. ft. x h x deg F (3.23 W/sq. m x K) as determined according to NFRC 100.
 - 2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have a SHGC of no greater than 0.45 as determined according to NFRC 200.
 - 3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.
- E. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
- 1. Outdoor-Indoor Transmission Class: Minimum 34.
- F. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
- 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 - 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. Interior Ambient-Air Temperature: 75 deg F (24 deg C).
- G. Structural-Sealant Joints:
- 1. Designed to carry gravity loads of glazing.
- H. Structural Sealant: ASTM C 1184. Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed, aluminum-framed storefronts without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
- 1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 - 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate, because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.3 STOREFRONT AND WINDOW SYSTEMS

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Exterior Framing Construction: Thermally improved.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front.
 - 4. Finish: High-performance organic finish.
 - 5. Fabrication Method: Either factory or Field-fabricated stick system.
 - 6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 7. Steel Reinforcement: As required by manufacturer.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 GLAZING

- A. Glazing: Comply with Division 8 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Structural Glazing Sealants: ASTM C 1184 chemically curing silicone formulation that is compatible with system components with which it comes in contact; specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.
 - 1. Color: As selected by Architect from manufacturer's full range of colors.
- E. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
 - 1. Color: Match structural sealant.

2.5 MATERIALS

- A. Sheet and Plate: ASTM B 209 (ASTM B 209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
- C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.

- D. Structural Profiles: ASTM B 308/B 308M.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
 - 4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

5. Provisions for field replacement of glazing from interior.
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
 - E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
 - F. Storefront Framing: Fabricate components for assembly using screw-spline system.
 - G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

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

2.9 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 6. Seal perimeter and other joints watertight unless otherwise indicated.

 7. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 8. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- B. Set continuous sill members and flashing in full sealant bed, as specified in Division 7 Section "Joint Sealants," to produce weathertight installation.
- C. Install components plumb and true in alignment with established lines and grades.
- D. Install operable units level and plumb, securely anchored, and without distortion. Adjust weatherstripping contact and hardware movement to produce proper operation.
- E. Install glazing as specified in Division 8 Section "Glazing."
- F. Install weatherseal sealant according to Division 7 Section "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed storefronts to comply with the following maximum tolerances:
1. Plumb: 1/4 inch in 40 feet.
 2. Level: 1/8 inch in 20 feet.
 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed storefronts.
 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.
 2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 70 percent completion.
 3. Water Penetration: ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa) and shall not evidence water penetration.
- C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
 1. Test a minimum of two areas on each building facade.
 2. Repair installation areas damaged by testing.
- D. Aluminum-framed storefronts will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 08 43 13

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for windows, doors, interior borrowed lites, storefront framing and glazed curtain walls.
 - 2. Glazing sealants and accessories.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass the following products; 12 inches square.
 - 1. Tinted glass.
 - 2. Coated glass.
 - 3. Laminated glass.
 - 4. Insulating glass.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 QUALITY ASSURANCE

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

- B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.8 WARRANTY

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

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, but limited to:
 1. AGC Glass North America
 2. AFG Industries
 3. Guardian Industries Corp.
 4. Pilkington North America
 5. PPG Industries, Inc.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 1. Design Wind Pressures: As indicated on Structural Drawings.
 2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 GLASS PRODUCTS, GENERAL

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

- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC, the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

2.4 GLASS PRODUCTS

- A. Ultraclear Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent and solar heat gain coefficient of not less than 0.87.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Ceramic-Coated Spandrel Glass: ASTM C 1048, Type I, Condition B, Quality-Q3.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - 2. Perimeter Spacer: Manufacturer's standard spacer material and construction
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING SEALANTS (As Needed)

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include but are not limited to the following:
 - a. Dow Corning Corporation; 790
 - b. GE Advanced Materials – Silicones; SilPruf LM SCS2700
 - c. May National Associates, Inc., Bondaflex Sil 290
 - d. Pecora Corporation: 890
 - e. Sika Corporation, Construction Products Division; SikaSil.

2.7 GLAZING TAPES (As Needed)

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- L. Adjust glazing channel dimensions as required by Project Conditions during installation to provide necessary bite on glass, minimum edge and face clearances and adequate sealant thickness with reasonable tolerances.

3.4 TAPE GLAZING

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

3.5 GASKET GLAZING (DRY)

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

3.6 SEALANT GLAZING (WET)

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

3.7 LOCK-STRIP GASKET GLAZING

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

3.8 CLEANING AND PROTECTION

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

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.9 GLASS SCHEDULE

- A. Glass Type GL-1: Low-E-coated, clear insulating glass
 1. Basis-of-Design Product: AGC Energy Select 23
 2. Overall Unit Thickness: 1 inch.
 3. Minimum Thickness of Each Glass Lite: 1/4".
 4. Outdoor Lite: Tempered float glass.
 5. Interspace Content: Air/Argon.
 6. Indoor Lite: Tempered float glass.
 7. Low-E Coating: Sputtered on second surface.
 8. Winter Nighttime U-Factor: 0.29/0.24.
 9. Summer Daytime U-Factor: 0.27/0.21
 10. Visible Light Transmittance: 50 percent minimum.
 11. Solar Heat Gain Coefficient: 0.23 maximum.
 12. Safety glazing required.

END OF SECTION 08 80 00

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 09 11 10 - NON-LOAD-BEARING STEEL FRAMING (INTERIORS)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 2. Protective Coating: corrosion resistance zinc coating, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:

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

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: 2 inches min.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 25 gauge with 20 gauge for high impact drywall bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 25 gauge with 20 gauge for high impact drywall.
 - b. Depth: Unless otherwise noted (5 5/8 at plumbing walls.)
3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base Metal Thickness: 25 gauge.
4. Resilient Furring Channels: 3/4 inch deep members designed to reduce sound transmission.
 - a. Configuration: Hat shaped.

F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; 640-C Drywall Furring System.
 - c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 25 gauge with 20 gauge for high impact drywall.
2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
 - 2) Superior Metal Trim; Superior Flex Track System (SFT).

B. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

2.4 AUXILIARY MATERIALS (As needed)

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

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

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

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

3.4 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

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

3.5 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 - 1. Space studs as follows:
 - a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
 - b. Multilayer Application: 16 inches o.c., unless otherwise indicated.
 - c. Tile backing panels: 16 inches o.c., unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure (if needed for forces opening / closing doors.)
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.
- D. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.
- F. Stud wall bridging (horizontal) any 25 ga studs 12' 0" or taller shall have horizontal bridging at half way point of height.

END OF SECTION 09 11 10

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 09 25 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.4 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.

1.5 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

- A. 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 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum Co.
 - b. BPB America Inc.
 - c. G-P Gypsum.
 - d. National Gypsum Company.
 - e. USG Corporation.
- B. Standard Non Rated:
 1. Thickness: 5/8"
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Type X:
 1. Thickness: 5/8 inch. As required for Fire Resistance Assembly.
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- D. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
 1. Thickness: 5/8 inch
 2. Long Edges Tapered and featured (rounded or beveled) for prefilling.
- E. High impact – fiber reinforced Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board, equal to U.S. Gypsum Mold Tough VHI Firecode X Panels plus paperless.
 1. Core: 5/8 inch regular type or 5/8 inch Type X where called for.
 2. Long Edges: Tapered.

- F. Liner Panels: High performance panels for use in shaft wall or area separation systems.
 - 1. Thickness: 1 inch.

2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
- 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, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.5 AUXILIARY MATERIALS (as needed)

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: As specified in Division 7 Section "Building Insulation"
- E. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."
- F. 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 ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 1. Regular Type: Vertical or horizontal surfaces, unless otherwise indicated.
 2. Type X: Where required for fire-resistance-rated assembly.
 3. Ceiling Type: Ceiling surfaces.
 4. High-Impact Type: Where Indicated.
 5. Liner Panels: Where 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) or horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from

parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws

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

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 according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. Bullnose Bead: Use at outside corners.
 3. LC-Bead: Use at exposed panel edges.
 4. L-Bead: Use (where needed).
 5. U-Bead: Use at exposed panel edges.
 6. Control joint (See 3.7)

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, rounded or 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 according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4 finish:
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.

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

3.7 CRACK CONTROL

- a. Space control joints not more than 40' o.c. ceilings.
- b. Space control joints where ceiling framing and furring changes direction.
- c. Space control joints in wall no more than 30'-0" o.c.

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Initial Selection: For components with factory-applied finishes.

1.3 CLOSEOUT SUBMITTALS

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

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E 1264.
 - 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

- A. Contractor shall match existing terminal ceiling panels.
- B. Manufactures: 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. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. Chicago Metallic Corporation
 - 4. Tectum, Inc.
 - 5. USG Interiors, Inc., a subsidiary of USG Corporation.
- C. Color: Match existing terminal ceiling panels.
- D. Light Reflectance (LR): Match existing terminal ceiling panels.
- E. Ceiling Attenuation Class (CAC): Match existing terminal ceiling panels.
- F. Noise Reduction Coefficient (NRC): Match existing terminal ceiling panels.
- G. Articulation Class (AC): Match existing terminal ceiling panels.
- H. Edge/Joint Detail: Match existing terminal ceiling panels.
- I. Thickness: Match existing terminal ceiling panels.

- J. Modular Size: Match existing terminal ceiling panels.
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work, include but are not limited to, one of the following:
 - 1. Armstrong World Industries, Inc. (
 - 2. CertainTeed Corporation
 - 3. Chicago Metallic Corporation
 - 4. USG Interiors; Subsidiary of USG Corporation.
- B. Metal Suspension-System Standard: Match existing terminal ceiling. Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
 - 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.

2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: As required by manufacturer.
 - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.
 - c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316.
 - d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
 - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by

testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch minimum diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- diameter bolts.
- F. Hold-Down Clips (where required): Manufacturer's standard hold-down.
- G. Impact Clips (where required): Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work, include but are not limited to, one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corporation
 - 3. Chicago Metallic Corporation
 - 4. USG Interiors; Subsidiary of USG Corporation.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and

- appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 - b. Install panels with pattern running in one direction parallel to axis of space.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.

5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down or impact clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
8. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

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

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 09 91 13 - EXTERIOR PAINTING

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 surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Concrete.
 - 2. Galvanized metal (Hollow Metal).
 - 3. Trim fabrications.
- B. Related Sections include the following:
 - 1. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 9 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.
 - 3. Division 9 Painting Sections for special use coatings

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional [5] percent, but not less than [1 gal. (3.8 L)] of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Benjamin Moore & Co.
 - 2. Benjamin Moore & Co., Limited (Canada).
 - 3. California Paints.
 - 4. Duron, Inc.
 - 5. ICI Paints.
 - 6. Porter Paints.
 - 7. PPG Architectural Finishes, Inc.
 - 8. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from manufacturer's full range..

2.3 PRIMERS/SEALERS

- A. Alkali-Resistant Primer: MPI #3.
 - 1. VOC Content: E Range of E1, E2, or E3.
- B. Bonding Primer (Water Based): MPI #17.
 - 1. VOC Content: E Range of E1, E2, or E3.
- C. Bonding Primer (Solvent Based): MPI #69.

1. VOC Content: E Range of E1, E2, or E3.

2.4 METAL PRIMERS

- A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E1 or E2.

- B. Quick-Drying Alkyd Metal Primer: MPI #76.

1. VOC Content: E Range of E1 or E2.

2.5 EXTERIOR LATEX PAINTS

- A. Exterior Latex (Flat): MPI #10 (Gloss Level 1).

1. VOC Content: E Range of E1, E2, or E3.

- B. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

1. VOC Content: E Range of E1, E2, or E3.

2.6 EXTERIOR ALKYD PAINTS

- A. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).

1. VOC Content: E Range of E1 or E2.

2. VOC Content: E Range of E1 or E2.

2.7 QUICK-DRYING ENAMELS

- A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).

1. VOC Content: E Range of E1, E2, or E3.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
 2. Wood: 15 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Galvanized-Metal Substrates: Hollow metal remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

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

3.5 CLEANING AND PROTECTION

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

3.6 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 - 1. Latex System: MPI EXT 3.1A.

- a. Prime Coat: Exterior latex matching topcoat.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (flat).

- B. Galvanized-Metal Substrates: (Hollow Metal)
 - 1. Latex System: MPI EXT 5.3A.
 - a. Prime Coat: Cementitious galvanized-metal primer.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (semigloss)

- C. Exterior trim.
 - 1. Latex System: MPI EXT 6.4K.
 - a. Prime Coat: Exterior latex wood primer.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (semigloss).

 - 2. Latex Over Alkyd Primer System: MPI EXT 6.4G.
 - a. Prime Coat: Exterior alkyd wood primer.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (semigloss).

- D. Plastic Trim Fabrication Substrates:
 - 1. Latex System: MPI EXT 6.8A.
 - a. Prime Coat: Bonding primer (solvent based).
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (semigloss)

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 09 91 23 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete (where shown).
 - 2. Concrete masonry units (CMU) (Where shown).
 - 3. Steel.
 - 4. Galvanized metal.
 - 5. Wood.
 - 6. Gypsum board.
- B. Related Sections include the following:
 - 1. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 9 painting Sections for special-use coatings.
 - 3. Division 9 painting Sections for Exteriors

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Wall Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Benjamin Moore & Co.
2. Columbia Paint & Coatings.
3. Coronado Paint.
4. Frazee Paint.
5. General Paint.
6. Griggs Paint.
7. Kryton Canada Corporation.
8. Porter Paints.
9. PPG Architectural Finishes, Inc.
10. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC content of not more than 150 g/L.
3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
4. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.

- q. Lead.
- r. Mercury.
- s. Methyl ethyl ketone.
- t. Methyl isobutyl ketone.
- u. Methylene chloride.
- v. Naphthalene.
- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

1. VOC Content: E Range of E2 or E3.

2.4 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

1. VOC Content: E Range of E2 or E3.
2. Environmental Performance Rating: EPR 1.

2.5 METAL PRIMERS

A. Quick-Drying Alkyd Metal Primer: MPI #76.

1. VOC Content: E Range of E2 or E3.

B. Waterborne Galvanized-Metal Primer: MPI #134.

1. VOC Content: E Range of E2 or E3.
2. Environmental Performance Rating: EPR 1.

2.6 LATEX PAINTS

A. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).

1. VOC Content: E Range of E2 or E3.
2. Environmental Performance Rating: EPR 1

2.7 ALKYD PAINTS

A. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).

1. VOC Content: E Range of E1 or E2.
2. Environmental Performance Rating: EPR 1

2.8 QUICK-DRYING ENAMELS

- A. Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).
 1. VOC Content: E Range of E2 or E3.

2.9 FLOOR COATINGS

- A. Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.
 1. VOC Content: E Range of E2 or E3.

2.10 STAINED WOOD

- A. Water-Based Varnish over Stain System MPI INT 6.3W:
 1. Stain Coat: Stain, semitransparent, for interior wood MPI #90.
 - a. First Intermediate Coat: Water-based varnish matching topcoat.
 - b. Second Intermediate Coat: Water-based varnish matching topcoat.
 - c. Topcoat: Varnish, water based, clear, satin (MPI Gloss Level 4), MPI #128.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Wood: 15 percent.
 3. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

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

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 1. Latex System: MPI INT 3.1E.
 - a. Prime Coat: Interior latex matching topcoat.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (flat)
- B. CMU Substrates:
 1. Latex System: MPI INT 4.2A.
 - a. Prime Coat: Interior/exterior latex block filler.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (eggshell)
- C. Steel Substrates:
 1. Quick-Drying Enamel System: MPI INT 5.1A.
 - a. Prime Coat: Quick-drying alkyd metal primer.
 - b. Intermediate Coat: Quick-drying enamel matching topcoat.
 - c. Topcoat: Quick-drying enamel (semigloss)
- D. Galvanized-Metal Substrates:

1. Latex Over Waterborne Primer System: MPI INT 5.3J.
 - a. Prime Coat: Waterborne galvanized-metal primer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (semigloss).

- E. Dressed Lumber Substrates: Including doors Wood sealer with two coats of clear polyutherne.

- F. Gypsum Board Substrates:
 1. Latex System: MPI INT 9.2A.
 - a. Prime Coat: Interior latex primer/sealer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (eggshell).

- G. Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings
 1. Latex System: MPI INT 10.1A.
 - a. Prime Coat: Interior latex primer/sealer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (flat).

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 10 21 13.14 - STAINLESS-STEEL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes stainless-steel toilet compartments configured as toilet enclosures and urinal screens.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
 - 4. Show locations of centerlines of toilet fixtures.
 - 5. Show locations of floor drains.
 - 6. Show overhead support or bracing locations.
- C. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.3 CLOSEOUT SUBMITTALS

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

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: One hinge(s) with associated fasteners.

2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One door bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 STAINLESS-STEEL TOILET COMPARTMENTS

- 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. Accurate Partitions Corporation.
 2. Ampco, Inc.
 3. Bradley Corporation; Mills Partitions.
 4. Comtec Industries/Capitol Partitions.
 5. General Partitions Mfg. Corp.
 6. Global Steel Products Corp.
 7. Hadrian Manufacturing Inc.
 8. Knickerbocker Partition Corporation.
 9. Metpar Corp.
 10. Partition Systems Incorporated of South Carolina.
 11. Rockville Partitions Incorporated.
 12. Santana Products, Inc.
 13. Sanymetal; a Crane Plumbing company.
 14. Weis-Robart Partitions, Inc.
- B. Toilet-Enclosure Style: Overhead braced, Floor anchored.
- C. Urinal-Screen Style: Wall hung flat panel.

- D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Provide with no-sightline system. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of **1 inch (25 mm)** for doors and panels and **1-1/4 inches (32 mm)** for pilasters.
 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand applied downward load on grab bar of at least **250 lbf (1112 N)**, when tested according to ASTM F 446, without deformation of panel.
 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
- E. Urinal-Screen Construction:
1. Flat-Panel Urinal Screen: Matching panel construction.
 2. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with full-height flanges for wall attachment, and maximum **1-1/4 inches (32 mm)** thick.
- F. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:
1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than **0.038 inch (0.95 mm)**.
 2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than **0.050 inch (1.27 mm)**.
 3. Panels: Manufacturer's standard thickness, but not less than **0.031 inch (0.79 mm)**
 4. Doors: Manufacturer's standard thickness, but not less than **0.031 inch (0.79 mm)**.
 5. Flat-Panel Urinal Screens: Thickness matching the panels.
 6. Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than **0.031 inch (0.79 mm)**.
- G. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than **0.031-inch (0.79-mm)** nominal thickness and **3 inches (76 mm)** high, finished to match hardware.
- H. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
- I. Stainless-Steel Finish: Manufacturer's standard textured finish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
 - 1. Material: Stainless steel.
 - 2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position allowing emergency access by lifting door.
 - 3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors[and entrance-screen doors].
 - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: **ASTM B 221** (ASTM B 221M).
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless-Steel Castings: ASTM A 743/A 743M.
- G. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide in-swinging doors for standard toilet compartments and **36-inch- (914-mm-)** wide out-swinging doors with a minimum **32-inch- (813-mm-)** wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: **1/2 inch (13 mm)**.
 - b. Panels and Walls: **1 inch (25 mm)**.
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

- a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than **2 inches (51 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

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

END OF SECTION 10 21 13.14

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 10 28 00 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Under lavatory guards.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
2. Material and finish descriptions.
3. Features that will be included for Project.
4. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

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

D. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM 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. Bradley Corporation (Basis of Design)
 2. American Specialties, Inc.
 3. Bobrick Washroom Equipment, Inc.
 4. Kimberly-Clark Professional
- B. Paper Towel (Folded) Dispenser: (Mark 1)
1. Model No. 2A10-11
 2. Mounting: Surface mounted.
 3. Minimum Capacity: 400 C-fold or 525 multifold towels.
 4. Material and Finish: Stainless steel, No. 4 finish (satin).
 5. Lockset: Tumbler type.
 6. Refill Indicators: Pierced slots at sides or front.
- C. Toilet Tissue (Roll) Dispenser: (Mark 3A)
1. Model No. 5922
 2. Description: Seat cover dispenser/Dual roll tissue dispenser
 3. Mounting: Recessed
 4. Operation: Non-controlled delivery
 5. Capacity: Two rolls.
 6. Material and Finish: Stainless steel, No. 4 finish (satin).
- D. Toilet Tissue (Roll) Dispenser: (Mark 3B)
1. Model No. 592
 2. Description: Seat cover dispenser/Dual roll tissue dispenser
 3. Mounting: Partition Mounted
 4. Operation: Non-controlled delivery
 5. Capacity: Two rolls.
 6. Material and Finish: Stainless steel, No. 4 finish (satin).
- E. Toilet Tissue (Roll) Dispenser: (Mark 3C)
1. Model No. 5921
 2. Description: Seat cover dispenser/Dual roll tissue dispenser
 3. Mounting: Partition Mounted – Flush one side for grab bar installation
 4. Operation: Non-controlled delivery
 5. Capacity: Two rolls.
 6. Material and Finish: Stainless steel, No. 4 finish (satin).

F. Liquid-Soap Dispenser: (Mark 5)

1. Model No. Match existing terminal restrooms or Kimberly-Clark-KCC92145
2. Description: Designed for dispensing soap in liquid.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 1000 ml.
5. Materials: Black Plastic
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

G. Grab Bar: (Mark 6A, 6B, 6C, and 6D)

1. Mounting: Flanges with concealed fasteners.
2. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
3. Outside Diameter: 1-1/2 inches
4. Configuration and Length: As indicated on Drawings.

H. Mirror Unit: (Mark 7)

1. Model No. 747-18"x36"
2. Frame: Frameless.
3. Size: As indicated on Drawings.

I. Diaper Changing Station: (Mark 13)

1. Model No. 962
2. Surface Mounted
3. Stainless Steel
4. Integrated Liner Dispenser

2.3 UNDERLAVATORY GUARDS

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

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.

- C. Material and Finish: Antimicrobial, molded plastic, white.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

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

END OF SECTION 10 28 00

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 13 34 23.01 – MODULAR BUILDING UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes prefabricated steel Modular Building Units.
- B. Gate Counters, electronic information panels, electronic gate signage, furniture and gate equipment shall be by others.
- C. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."; State of Florida Accessibility requirements as listed below in Section 2.4. B.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Control booths shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI7:
 - 1. Dead Loads:
 - a. Roof: 15 PSF (10 PSF Dead – 5 PSF Collateral)
 - b. Wall: 10 PSF
 - c. Floor: 15 PSF
 - 2. Live Loads:
 - a. Floor: 100PSF
 - 3. Roof Loads
 - a. Roof: 20PSF
 - 4. Wind Loads: 147 MPH, Risk Category III, Exposure D per ASCE 7-10.
 - 5. Deflection Limits: Design framing system to withstand design loads with deflections, limits noted in the Florida Building Code:
 - a. Applied load only: L/360;
 - b. Applied Load + Dead Load L/240
- B. Glazed openings to be impact resistant per ASTM E1996.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control booths.
 - 1. Include data substantiating that materials comply with requirements.

- B. Shop Drawings: For Manufactured Building Units. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For Modular Building Units with factory-applied color finishes.
- D. Samples for Verification: For exposed finishes, in manufacturer's standard sizes.
- E. Delegated-Design Submittal: For Modular Building Units indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATION SUBMITTALS

- A. Welding certificates.
- B. Warranty: Sample of special warranty.
- C. Certification Submittal of shop drawings for approval by the Florida State Department of Community Affairs (DCA).

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For all required equipment per Project Manager to include maintenance manuals.
- B. As-Built Plans: Submit complete as-built plans of all Work, including interface with other Work, in accordance with requirements as specified in Section 013300 "Submittal Procedures".

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."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 3. AWS D1.3, "Structural Welding Code - Sheet Steel."
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Safety Glazing Products: Category II materials complying with testing requirements in 16 CFR 1201.
 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of SGCC or another certification agency acceptable to authorities having jurisdiction.
- E. Pre-installation Conference: Conduct pre-installation conference at the Project site.

1.7 COORDINATION

- A. Coordinate installation of anchorages for Modular Building Units. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace wall panels that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Minimum One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide materials and components as shown on plans and specifications provided by Project Manager.

2.2 MANUFACTURED BUILDING UNITS, GENERAL

- A. General: Provide a complete, integrated set of mutually dependent components that form a completely assembled building addition with prefabricated building units, ready for installation on Project site.
 - 1. Building Style: Modular Building Manufacturer's Deluxe style, square cornered metal siding. Individual units shall be per plans provided by Project Manager and Owner's Architect.
 - 2. Perimeter steel floor system with clear span trusses.
 - a. Provide full shop drawings certified for the State of Florida by a licensed engineer in the State of Florida.
- B. Modular Building Manufacturer shall meet the following criteria:
 - 1. Manufacturer shall be pre-certified by the Florida Department of Community Affairs.
 - 2. Manufacturer shall have successfully completed a minimum of one airport terminal facility within the last 4 years – provide examples and client references.
 - 3. All required FAA security clearances and requirements.
 - 4. All Panama City Airport security clearances and requirements.

2.3 MANUFACTURED BUILDING UNITS

- A. Manufacturers: Subject to compliance with requirements, manufacturer's offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Basis of Design:
 - a. Ramtech Building Systems, Inc. (817-473-8376 – Jeff Ward);
 - b. Modular Building Systems, LLC
 - c. Vanguard Modular Building Systems

2.4 FABRICATION

- A. Fabricate Building Structure completely in factory.
- B. All units and components shall comply with:
 - 1. 2017 Florida Building Code (FBC) – Construction Type II-B, non-combustible construction fully sprinklered per Code and Project Manager
 - 2. 2017 FBC Plumbing Code
 - 3. 2017 FBC Energy Code
 - 4. 2017 FBC Accessibility Code
 - 5. 2014 National Electrical Code (NEC)
 - 6. 2016 NFPA 415
 - 7. All Federal, State and Local Codes as required
- C. Shop Drawings shall be prepared and stamped/signed by State of Florida licensed Architects and Engineers.
- D. Fabrication shall be observed and certified by a Third-Party Inspector approved in the State of Florida.
- E. Each unit shall bear a plaque designating certification by the Florida State Department of Community Affairs (DCA). This plaque shall be attached to each modular unit and be visible prior to transportation from the manufacturer's facility.
- F. Pre-glaze windows and doors at factory.
- G. Pre-wire building units at factory, ready for connection to service at Project site.
- H. Provide temporary weather-proof enclosure for all open sides of building units including structural supports for shipping.
- I. Deliver Units to site in order of their installation. Provide sequential connection and protect open sides from weather and dust until connection of adjacent unit is completed.
- J. Modular provider to coordinate with General Contractor and sub-contractors installing Security and Communications wiring and appliances. Coordinate installation of Suspended ceilings and carpet with General Contractor.
- K. Modular provider to coordinate with General Contractor and sub-contractors installing Fire Protection and appliances.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 FRAME/FLOOR

- A. TYPE: Perimeter steel.
- B. STEEL CHANNEL: M12" x 11.8#
- C. JOISTS: 10" 14 ga. steel "CEE" (1" x 3 1/2" x 10" x 3 1/2" x 1") members installed at 16" o.c.
- D. HITCH: Demountable with 2 5/16" coupler and elevating jack.
 - 1. Manufacturer shall be responsible for removing hitches from the modules.
 - 2. Hitches shall remain the property of the Owner,
- E. INSULATION: R30 FSK faced fiberglass batts. Insulation shall be Johns Manville FSK-25, Flame Spread <25 and Smoke Developed <50 per ASTM E84.
- F. DECKING: Single layer 1" Plycem CemDeck, sanded, sealed, tongue and groove installed perpendicular to floor joists.
 - 1. All waterproofing in wet area's and any required underlayment shall be the responsibility of the Contractor.
- G. AXLES: 6000# axles as required.
 - 1. Modular provider shall be responsible for removing axels from the modules and remove them from the site.
 - 2. Axels shall remain the property of the Owner,
- H. TIRES: 8:00 x 14.5, 10 ply rated on all units.
 - 1. The Modular provider shall be responsible for removing tires from the modules.
 - 2. Tires shall remain the property of the Owner,
- I. PAINT: Black latex paint on entire assembly less axles.
- J. BOTTOM PAN: 30 Gauge galvanized steel.

2.7 FLOOR FINISHES:

- A. All floor finishes and underlayment for floor finishes shall be provided and installed on site by the Contractor.

2.8 EXTERIOR WALLS

- A. TYPE: Construction Type II-b
- B. STUDS: 6" Galvanized steel studs, 18 gauge @ 24" o.c. Steel studs shall be Clark Dietrich 600S162-43 (33Ksi, CP60) P-Punched (1-5/8" Flange Structural Stud).
- C. BOTTOM TRACK: 6" Galvanized steel track, 18 gauge. Steel track shall be Clark Dietrich 600T200-43 (33Ksi, CP60) unpunched, 2" leg.
- D. TOP TRACK: 6" Galvanized steel track, 18 gauge. Steel track shall be Clark Dietrich 600T200-43 (33Ksi, CP60) unpunched, 2" leg.

- E. BLOCKS: Blocks / straps per plans. All wood used for blocking shall be fire retardant treated wood, "Dricon" or equal.
- F. WALL HEIGHT: Exterior walls shall be parapet type, square profile to conceal the roof line. Wall height shall extend approximately 3" above roof peak.
- G. INTERIOR FINISH: 5/8" Type "X" gypsum wallboard, level "0".
 - 1. Gypsum shall be National Gypsum, Gold Bond Fire-Shield. Long edges shall be tapered.
 - 2. Gypsum at ceramic tile areas in restrooms and janitor's closet shall be National Gypsum, Gold Bond 5/8" exp Tile Backer, Fire-Shield Type "X". Long edges shall be square edge.
 - 3. Gypsum above ceramic tile in restrooms, janitor's closet and all of FCC Room (139) and Water Entry Room (146) shall be National Gypsum, Gold Bond 5/8" xp, Fire-Shield Type "X". Long edges shall be tapered edge.
 - 4. All wall finishes including tape, bed, texture, painting & ceramic tile provided and installed on site by the Contractor.
- H. WALL CAVITY INSULATION: R-19 FSK faced fiberglass batts shall be installed in all walls, full height from floor to the roofline. Insulation shall be Johns Manville FSK-25, Flame Spread <25 and Smoke Developed <50 per ASTM E84.
- I. SHEAR WALLS: Designated shear walls per plans shall have full-height 24 Ga. Galvanized steel sheets.
- J. SHEATHING: 5/8" USG Securock, Glass-Mat Sheathing, Firecode X.
- K. AIR & MOISTURE BARRIER: Tyvek commercial wrap shall be installed over the 5/8" Securock for air and moisture barrier. Excludes air barrier testing.
- L. SIDING: 24 Gauge, high rib commercial steel siding, installed vertical, Hefti-Rib profile, exposed fasters and baked enamel finish. The siding shall be attached to the 16 gauge zee's.
 - 1. Color shall be chosen from manufacturer's full range of colors.
- M. TRIM:
 - 1. 24 gauge "Z" bottom trim, between siding and skirting. Color to be same as siding.
 - 2. 24 gauge "J" trim around window & doors. Color to be same as siding.
 - 3. 24 gauge corner trim. Color to be same as siding.
 - 4. 12" 24 gauge hat trim at each module mate-line. Hat trim shall be site installed after module installation. Color to be same as siding.
- N. SCUPPER BOXES: 24 Gauge painted steel scuppers with overflows shall be installed as shown on drawings.
 - 1. Color shall be chosen from manufacturer's full range of colors.
- O. DOWNSPOUTS: 24 Gauge painted steel downspouts shall be installed on north and south sides of the building. Each downspout shall be terminated top of the concrete apron.
 - 1. Color shall be chosen from manufacturer's full range of colors.
- P. PARAPET WALL CAP: The top of the parapet wall on all sides of the building will be finished with a 24 Gauge steel cap with baked on enamel finish. Pressure treated fire retardant wood under parapet cap.
 - 1. Color shall be chosen from manufacturer's full range of colors.

Q. SKIRTING

1. The skirt walls shall be framed with 6" Galvanized steel studs, 18 gauge @ 24" o.c. Steel studs shall be Dietrich CSJ or equal.
2. R-19 Un-faced fiberglass batts shall be installed in wall cavity of skirt walls.
3. The skirt wall have be sheathed with 5/8" USG Securock, Glass-Mat Sheathing, Firecode X. The back side of the skirt wall shall be open and not sheathed (except at shear wall locations).
4. Designated skirt walls and under-floor walls shall be shear walls and sheathed with 24 Ga. Galvanized steel sheets.
5. Tyvek commercial wrap shall be installed over the 5/8" Securock for air and moisture barrier.
6. 24 Gauge, high rib commercial steel siding, installed horizontal, Hefti-Rib profile, exposed fasters and baked enamel finish.
7. Color shall be chosen from manufacturer's full range of colors.

2.9 INTERIOR WALLS

- A. STUDS: 3-5/8" Galvanized steel studs, 20 gauge @ 16" o.c. Steel studs shall be Clark Dietrich 362S162-33 (33Ksi, CP60) P-Punched (1-5/8" Flange Structural Stud).
- B. BOTTOM TRACK: 3-5/8" Galvanized steel track, 20 gauge. Steel track shall be Clark Dietrich 362T200-33 (33Ksi, CP60) unpunched, 2" leg.
- C. TOP TRACK (SLOTTED): 3-5/8" Galvanized steel track, 20 gauge, slotted. Steel track shall be Clark Dietrich MaxTrak (SLT) 3" leg.
- D. BLOCKS: Blocks / straps per plans. All wood used for blocking shall be fire retardant treated wood, "Dricon" or equal.
- E. WALL HEIGHT: Walls shall be built full height to roof deck or to underside of truss.
- F. FINISH: 5/8" Type "X" gypsum wallboard, level "0".
 1. Gypsum shall be National Gypsum, Gold Bond Fire-Shield. Long edges shall be tapered.
 2. Gypsum at ceramic tile areas in restrooms and janitor's closet shall be National Gypsum, Gold Bond 5/8" exp Tile Backer, Fire-Shield Type "X". Long edges shall be square edge.
 3. Gypsum above ceramic tile in restrooms, janitor's closet and all of FCC Room (139) and Water Entry Room (146) shall be National Gypsum, Gold Bond 5/8" xp, Fire-Shield Type "X". Long edges shall be tapered edge.
 4. All wall finishes including tape, bed, texture, painting & ceramic tile provided and installed on site by the Contractor.
- G. SHEAR WALLS: Designated shear walls per plans shall have full-height 24 Ga. Galvanized steel sheets.
- H. INSULATION: R-19 unfaced fiberglass batts full height in all walls.

2.10 MOULDING

- A. BASE: All vinyl/rubber cove base and ceramic base shall be provided and installed on site by the Contractor.

2.11 ROOF

- A. PURLINS: 14 Gauge x 8" galvanized steel joists installed @ 32" o.c., maximum. Steel joist shall be Clark Dietrich 800S250-68 (50Ksi, CP60) P-Punched (2-1/2" Flange Structural Stud).
- B. RAILS: 14 Gauge x 8" galvanized steel track; Steel track shall be Clark Dietrich 800T300-68 (50Ksi, CP60) unpunched (3" Leg Structural Track).
- C. STEEL TRUSS: Open web steel truss designed to provide clear roof span full length of each module mate.
 - 1. Trusses and Columns shall be painted fabricators standard black shop primer.
 - 2. Roof slope shall be 1/4" in 12.
- D. BRIDGING: Steel angle installed per design drawings.
 - 1. All bridging shall be painted fabricators standard black shop primer.
- E. LAY-IN CEILINGS: Lay-in ceiling shall be provided and installed on site by the Contractor.
- F. HARD PAN CEILINGS: 11 hard pan ceilings shall be provided and installed on site By the Contractor, including, tape, bed, texture and painting of hard pan ceilings.
- G. CEILING HEIGHT: The structure shall accommodate a finished ceiling height which varies (see drawings.)
- H. SHEATHING: 1.5" x 22 Ga. Galvanized. G-60, "B" deck sheathing installed perpendicular to roof purlins.
- I. INSULATION: Rigid polyisocyanurate insulation shall be installed atop the "B" deck sheathing, with a total R value of 30.
- J. ROOF BOARD: 1/2" Densdeck Prime roof board Mule-Hide / Georgia Pacific, shall be install atop the rigid insulation on all horizontal surfaces.
 - 1. Vertical Parapet applications shall use 5/8" USG Securock Gypsum-Fiber roof Board.
- K. ROOFING: Mule-Hide 60 MIL EPDM membrane, white on black shall be fully adhered to the DensDeck Prime. 20-Year warranty shall be provided.
 - 1. White MH MOD mate-line tape, 12" wide shall be site installed at all mate-line seams.
 - 2. Poly-Iso crickets shall be site installed by the manufacturer.

2.12 EXTERIOR AND INTERIOR DOORS

- A. DOORS:
 - 1. Exterior Doors: Doors 1-3/4" x width x height per final plans and shall be insulated 14 Gauge hollow core commercial steel with factory primed finish. Refer to plans for fire ratings, window kits and louvers.

2. Interior Doors: Doors 1-3/4" x width x height per final plans and shall be 18 Gauge hollow core commercial steel with factory primed finish. Refer to plans for fire ratings, window kits and louvers.

B. FINISH: The interior and exterior side of the steel doors and frames shall be factory primed finish.

1. Painting of doors and frames shall be provided and installed on site by the Contractor.

2.13 HARDWARE

A. Contractor to provide a \$1,500 allowance per door. Coordinate with Owner for required hardware.

2.14 WINDOWS:

A. Exterior:

1. Type B1 and B2 windows.
 - a. FRAMES: All frames shall be thermally broken clear anodized aluminum storefront assembly, EFCO series 403 Center glazed.
 - b. GLAZING: Glass Type: Low-e coating in second surface, tinted insulating glass.
 - c. Overall unit thickness: 1".
 - d. Thickness of each glass lite: 1/4".
 - e. Exterior Lite: 1/4" Tempered float glass
 - f. Interspace content: Air/Argon
 - g. Indoor lite: 1/4" Tempered float glass
 - h. Provide privacy film at Type B1 Windows.

B. Glazing Performance:

1. Thermal:
 - a. Winter U-Factor/U-value: 0.29/0.24
 - b. Summer U-Factor/U-value: 0.27/0.21
 - c. Solar Heat Gain Coefficient: 0.23
2. Optical:
 - a. • Visible Light Transmittance: 50%

C. SERVICE: Service shall be provided and installed on site by the Contractor.

D. MAIN DISTRIBUTION PANEL: Main distribution panel shall be provided and installed on site by the Contractor.

E. TRANSFORMERS/SUB-PANELS/LIGHTING CONTROL/PANELS & DISCONNECTS: All transformers, sub-panels, lighting control panels and disconnects shall be provided and installed on site by the Contractor.

F. RACEWAY/CONDUCTORS: Minimum #12 AWG type THHN copper wire in concealed MC cable conduit with ground and/or EMT conduit. EMT conduit shall utilize insulated set-screw connectors.

- G. CENTRAL MODULAR JUNCTION BOX: All modular central junction boxes shall be 16" x 16" x 6" type 1 painted with screw cover and knockouts.
1. Central junction boxes shall be Eaton B-Line #16166SC.
 2. Extension (conduit & conductors) from central junction box to termination point shall be provided and installed on site by the Contractor.
- H. ALL INTERIOR LIGHTS: All interior lighting including exit signs shall be provided and installed on site by the Contractor including all conduits and conductors and lighting controls.
- I. EXTERIOR WALL PACK LIGHTS: Modular provider shall provide in wall conduit to flush mounted junction box (box to be 10'-0" AFF to box center) with gray weatherproof blank plate on exterior, 1" EMT conduit to be stubbed out of wall above ceiling on the interior with pull tape (all conductors by Contractor).
1. All exterior lighting, conductors and conduit from stub-out shall be provided and installed on site by DIA's General Contractor including all controls.
- J. TOGGLE SWITCHES: Modular provider shall provide line voltage in-wall toggle type switches per plans. Raceway shall be conductors in EMT conduit terminated above ceiling in junction box at each switch location.
1. All switch cover plates, labeling and extension (conduit & conductors) from stub-out to termination points shall be provided and installed on site by the Contractor.
- K. OCCUPANCY SENSOR LV SWITCHES:
1. Modular provider shall provide back box and 3/4" EMT conduit stubbed to above ceiling for all low voltage switches.
 2. Contractor shall provide conduit from stub out location to point of connection and provide all cabling and devices.
- L. RECEPTACLES
1. The modular provider shall provide in-wall receptacles per plans. Each circuit raceway from device to modular central junction box in each module shall be MC cable.
 2. All receptacle cover plates, labeling and extension (conduit & conductors) from central junction box to termination point shall be provided and installed on site by the Contractor.
 3. Provide 125v, 20 amp, NEMA 5-20R Duplex and quad convenience receptacles per plans. Designated quad receptacles shall be split power with each duplex on a dedicated circuit. Designated receptacles shall be tamper resistant, refer to plans for locations.
 - a. Device shall be: Leviton 5362-GYS, Color Gray.
 - b. If required: Tamper Resistant Device shall be: Leviton 8300-SGG, Color Gray.
 4. Provide NEMA 6-20R, single receptacle as shown for Comm rooms.
 - a. Device shall be: Leviton 5461-GY, Color Gray.
 5. Provide GFCI receptacles per plans. Designated GFCI receptacles shall be tamper resistant, refer to plans for locations.
 - a. Device shall be Leviton GFNT2-GY, Color Gray.
 - b. If required: Tamper Resistant Device shall be: Leviton GFTR2-GY, Color Gray.
 6. Provide exterior GFCI receptacles with vertical device mount metallic in-use cover per plans, receptacle to be installed 12" AFF to device center.
 - a. Device shall be Leviton GFNT2-GY, Color Gray.
 - b. In-Use Covers shall be Leviton #IUM1V-GY, Color Gray

- M. INTERIOR WIRED J-BOXES: The Modular provider shall provide wired circuits for hand dryers, flush valve sensors, access control power and fire alarm panel per plans. Each circuit raceway from device to central junction box in each module shall be MC cable.
1. Extension (conduit & conductors) from central junction box to termination point shall be provided and installed on site by the Contractor.
- N. THROUGH FLOOR POWER ROUGH-INS FOR PODIUMS: The Modular provider shall provide wired MC cable circuit extended under floor up through floor sleeve (3" EMT) with 10' of MC cable coiled for podium per plans. Each circuit raceway from device to central junction box in each module shall be MC cable with ground.
1. All extensions, connections, disconnects, device hardware and extension from central junction shall be provided and installed on site by the Contractor.
- O. THROUGH FLOOR POWER ROUGH-IN FOR FURINTURE TABLE: The Modular provider shall provide wired MC cable circuit extended under floor up through floor sleeves (1" & 2" EMT) with 10' of MC cable coiled per plans. Each circuit raceway from device to central junction box in each module shall be MC cable with ground.
1. All extensions, connections, disconnects, device hardware shall be provided and installed on site by the Contractor.
- P. ROUGH-IN FOR CENTRAL STATION AIR HANDLERS: The Modular provider shall provide and install conduit sleeve through exterior wall and capped and provide pull box above ceiling.
1. Above ceiling raceway, all conductors, disconnects and extension and connection to equipment shall be provided and installed on site by the Contractor.
- Q. IN-WALL HVAC CONTROL RACEWAY: The Modular provider shall provide in-wall 4" Square box with single gang mud ring, blank cover plate, 1" EMT conduit to above ceiling with pull tape and extended to cable tray termination point per plans.
1. Conduit color shall be: Brown bands 5' o.c.; Blank cover plate shall be painted Brown.
 2. Extension of conduit from termination point, grounding and connection to cable tray, all devices and cabling shall be provided and installed on site by the Contractor.
- R. CABLE TRAY: All cable trays shall be provided and installed on site by the Contractor.
- S. PODIUM ROUGH-INS: The Modular provider shall provide (3) 1" EMT conduits under floor, turned up through floor sleeve (3" Rigid, extended 2" AFF) and extended 4" AFF; (2) Conduits shall be routed up in exterior wall to 4" square box with single gang mud ring (for GIDS), conduits shall continue up to above ceiling stubbed out through wall and extended to cable tray termination point per plans.
1. The remaining 1" conduit shall be routed up in exterior wall continue up to above ceiling stubbed out just beyond the wall for Contractor to connect horizontal to the ticket scanner 1" conduit.
 2. The Modular provider shall provide (2) 1" EMT conduits under floor, turned up through floor sleeve (3" Rigid, extended 2" AFF) and extended 4" AFF; (2) Conduits shall be routed up in exterior wall to 4" square box with single gang mud ring (for GIDS), conduits shall continue up to above ceiling stubbed out through wall and extended to cable tray termination point per plans.
 3. 1) 1" EMT conduit under floor, turned up through podium floor sleeve (3" Rigid, extended 2" AFF) and extended 4" AFF; the 1" conduit shall be run under floor and turned up thru the 2" sleeve at the gate counter.

4. Extension of conduit from termination point, grounding, connection to cable tray, all devices and cabling shall be provided and installed on site by the Contractor.
- T. SECURITY/ACCESS CONTROL RACEWAY: The Modular provider shall provide in-wall 4” Square box with single gang mud ring, blank cover plate, 1" EMT conduit to above ceiling and stubbed out of wall approximately 12” with pull wire.
1. Conduit shall have Blue bands every 5’ and Blue cover plate.
 2. Extension of conduit from termination point to Comm room and all devices and cabling shall be provided and installed on site by the Contractor.
- U. FIRE ALARM RACEWAY: The Modular provider shall provide in-wall 4” Square box with single gang mud ring, blank cover plate, 1" EMT conduit to above ceiling and stubbed out of wall approximately 12” with pull wire.
1. Conduit, boxes and cover plate shall be factory Red.
 2. Locations shall be installed per approved Fire Alarm plans as directed by DIA’s Engineer.
 3. Extension of conduit from termination point for complete conduit raceway system and all devices and cabling shall be provided and installed on site by the Contractor.
 4. All conduits and cabling for all ceiling mounted devices shall be the provided and installed on site by the Contractor.
- V. CCTV RACEWAY: Exterior wall penetration sleeves shall be provided for CCTV.
1. All conduit, conductors, connections, disconnects and equipment shall be provided and installed on site by the Contractor.
- W. MISC: All electrical in (including panel) concessions shall be provided and installed on site by the Contractor.

2.15 PLUMBING

- A. WATERLINES: Type L Copper.
1. All lines in walls and above ceiling shall be insulated.
 2. All water lines in concealed spaces shall be installed by manufacturer in the plant.
 3. All CW and hot water lines in the multi-use restrooms shall be installed on site by the Contractor.
- B. WASTELINES:
1. With-in walls or chases shall be Cast Iron pipe and fittings and shall be cast iron and conforming to ASTM A 888 and CISPI Standard 301, waste and vent lines.
 2. Vent pipes shall be thru roof.
 3. All below floor connections to waste and vent drops shall be provided and installed on site by the Contractor.
- C. WATERHEATERS: All water heaters shall be provided and installed on site by Contractor.
- D. RESTROOMS:
1. DWV:
 - a. The Modular provider shall provide and install water closet carrier and lavatory carrier. Fixtures to be provided by Contractor.

- b. Water closet waste inlet shall be stubbed through wall and soil waste outlet stubbed below floor by Modular provider.
 - c. Lavatory drain waste shall be stubbed through wall and soil waste stubbed below floor by Modular provider.
 - d. Floor drain shall be provided, waste stubbed below floor.
 - e. Water closet, lavatory and floor drain shall be vented together and extended through roof by Modular provider.
 - f. Re-vent for floor drain shall be stubbed to below floor by Modular provider.
 - g. Below floor piping, floor drain p-trap and connections to water closet, lavatory, floor drain and floor plan re-vent drops shall be provided and installed on site by the Contractor
2. DOMESTIC WATER:
- a. The Modular provider shall provide cold and hot water supply lines in chase for lavatory, water closet and floor drain trap primer unit.
 - b. CW & hot water shall be stubbed through wall for lavatory and cw shall be terminated in wall at flush valve access opening for water closet, both lines capped.
 - c. Trap primer pump shall be installed in chase at toilet concealed sensor flush valve access opening location and extended below floor and connected to floor drain.
 - d. CW and hot water supply lines shall be stubbed out of wall above ceiling with cap per plans.
 - e. All fixtures, flush valves, stops, connection to fixtures, waste piping (below floor) and connection to water lines stubbed to above ceiling shall be provided and installed on site by the Contractor.
- E. WATER COOLER
1. DWM:
- a. The contractor shall provide and install water cooler carrier. Waste inlet shall be stubbed through for connection.
 - b. Below floor piping, floor drain p-trap, service sink p-trap and connections to water closet, lavatory, floor drain, floor drain re-vent and service sink re-vent drops shall be provided and installed on site by the Contractor.
2. DOMESTIC WATER:
- a. The contractor shall provide water supply lines shall be stubbed through wall for water cooler and all lines capped.
 - b. All fixtures, flush valves, stops, connection to fixtures, waste piping (below floor) and connection to water lines stubbed to above ceiling shall be provided and installed on site by the Contractor.
- 2.16 H.V.A.C.:
- A. All aspects of HVAC including restroom exhaust fans, smoke exhaust fans and all curbs shall be provided and installed on site by the Contractor.
 - B. The Modular provider shall provide rough openings in exterior walls for duct penetrations.

2.17 FURNISHINGS:

- A. RESTROOMS: All modesty partitions, urinal screens, grab bars, toilet tissue dispensers, paper towel dispensers, mirrors, toilet seat cover. Dispensers, napkin/tampon vendors, napkin disposals and electric hand dryers shall be provided and installed on site by the General Contractor.
- B. GENERAL: All Wall, door protection, Glass Security Partitions, gate service counters, boarding podiums, signage, informational displays, equipment and furniture shall be provided and installed on site by the Contractor.

2.18 MISC SYSTEMS

- A. FIRE EXTINGUISHERS: All fire extinguishers shall be provided and installed on site by the Contractor.
- B. FIRE ALARM SYSTEM: Complete fire alarm system shall be provided and installed on site by the Contractor.
 - 1. The Modular provider shall provide back boxes per spec section 10.17.
- C. FIRE SPRINKLER SYSTEM: Complete wet pipe fire sprinkler system shall be provided and installed on site by the Contractor.
- D. LIGHTING PROTECTION: Complete lightning protection system shall be provided and installed on site by the Contractor including any required penetrations.

2.19 SITE ACTIVIES

- A. GENERAL CONDITIONS: The Contractor shall provide: an on-site superintendent and Temporary Toilets from beginning module installation to completion of Modular Building scope of work.
- B. BUILDING PERMIT: The Modular provider shall obtain Florida DCA approval. The Contractor shall obtain local building permit for the Modular Building portion or the work.
- C. FOUNDATION: Contractor to provide poured concrete piers utilizing sonotubes as detailed on Structural Drawings. Manufacturer to determine layout.
- D. INSTALLATION: Modular provider to install modules on foundation described above; Interior close-up of mate-line on floors and interior walls; Install crickets per roof plan; Install 12” wide EPDM mate-line tape at all module mate-lines; Install 12” wide “Hat” sections over exterior steel siding; Skirt complete building; Install roof access hatch; Install EPDM walk pads; Flash all curbs (curbs provided and installed under GC scope of work); Extend vent pipes above roof as required.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Coordinate delivery, lay-down areas and construction site security and safety with the General Contractor.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Set Modular Building Units. Level base plates true to plane with full bearing on concrete bases.
- B. Fasten Modular Building Units securely to fully grouted masonry foundation piers with cast-in anchor bolts. Refer to structural foundation plans for size, location, grade and length.
- C. Connect electrical power service to power distribution system. Refer to electrical plans for feeder size, distribution, loads, location and device requirements.
- D. Contractor to connect HVAC Ductwork to exterior HVAC units (by others). Refer to HVAC plans for design, size, distribution, loads, location and device requirements.
- E. Coordinate with General Contractor and sub-contractors installing Security and Communications wiring and appliances prior to installation of Suspended ceilings and carpet with General Contractor.
- F. All exterior door security devices are to be coordinated with Standards and installed by the General Contractor

3.3 ADJUSTING

- A. Adjust doors, and hardware to operate smoothly, easily, properly, and without binding. Confirm that locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.
- C. After completing installation, inspect exposed finishes and repair damaged finishes.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the Lump Sum Contract price.

END OF SECTION 13 34 23.01

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 21 13 00 - BUILDING SPRINKLER SYSTEM

1 GENERAL

- 1.1 Drawings and General provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-23 Basic Mechanical Requirements and Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Extent of fire protection work is indicated on drawings and schedules, and by requirements of this section.
- 1.4 Refer to Division-9 sections for painting of fire protection piping; not work of this section.
- 1.5 Refer to Division-26 sections for the following work; not work of this section.
 - 1.5.1 Power supply wiring from power source to power connection on air compressors and local alarm bells. Include disconnects and required electrical devices, except where specified as furnished or factory-installed by manufacturer.
 - 1.5.2 Fire alarm connections for all flow switches, pressure switches, and supervisory (tamper) switches.
- 1.6 Quality Assurance: The Sprinkler Contractor shall be qualified as follows:
 - 1.6.1 Experience: Contractor shall have a minimum of ten years continuous experience.
 - 1.6.2 Home Office: The home office for the contractor shall be located within 125 miles of the project site.
- 1.7 Codes and Standards:
 - 1.7.1 NFPA Compliance: Install fire protection systems in accordance with NFPA 13 "Standard for the Installation of Sprinkler Systems"
 - 1.7.2 UL Compliance: Provide fire protection products in accordance with UL standards; provide UL label on each product.
 - 1.7.3 Fire Department/Marshal Compliance: Install fire protection systems in accordance with local regulations of fire department or fire marshal.
 - 1.7.4 Screw Thread Connections: Comply with local Fire Department/Fire Marshal regulations for sizes, threading and arrangement of connections for fire department equipment to sprinkler systems.

- 1.8 Approval Submittals:
- 1.8.1 Product Data: Submit manufacturer's technical product data and installation instructions for:
- Pipe and fittings
 - Basic pipe supports and hangers
 - Basic valves
 - Automatic sprinklers
- 1.10.2 Working (Shop) Drawings: Prepare working (shop) drawings of fire protection systems indicating pipe sizes, pipe locations, pipe elevations, fittings, shutoffs, hangers, equipment, and coordination with other building systems. Submittal shall show all requirements per NFPA-13. P.E. seal is not required.
- 1.11 Test Reports and Verification Submittals:
- 1.11.1 Certificate: Submit certificate of Aboveground Installation upon completion of fire protection piping work which indicates that work has been tested in accordance with NFPA 13 and NFPA 14, and that system is operational, complete, and has no defects.
- 1.11.2 Tag: Submit a copy of the sprinkler system tag. The installing fire sprinkler contractor shall be licensed in accordance with State Fire Marshal (SFM) Rule 4A-46. At the conclusion of the project and prior to the final inspection by the SFM the Contractor shall tag the fire sprinkler system in accordance with 4A-46.041.
- 1.12 O&M Data Submittals:
- 1.12.1 Record Drawings: At project closeout, submit record drawings of installed fire protection piping and products.
- 1.12.2 Maintenance Data: Submit a copy of all approval submittals. Submit maintenance data and parts lists for basic valves, etc. Include these data in O&M manual.
- 1.12.3 NFPA 25: Provide a copy of NFPA 25 in each O&M Manual.
- 2 PRODUCTS
- 2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in fire protection systems. Where more than one type of material or products are indicated, selection is Installer's option.
- 2.2 Basic Identification: Provide identification complying with Division-23 Basic Mechanical Materials and Methods section "Mechanical Identification", in accordance with the following listing:
- Fire Protection Piping: Plastic pipe markers. Fire piping exposed in mechanical and electrical rooms shall be painted red.

Fire Protection Valves: Plastic or brass valve tags

Fire Protection Signs: Provide the following signs:

At each sprinkler valve, sign indicating what portion of system valve controls and hydraulic design data.

At each outside alarm device, sign indicating what authority to call if device is activated.

At each auxiliary drain, a sign indicating location.

2.3 Basic Pipes and Pipe Fittings: Provide pipes and pipe fittings complying with Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing. Where multiple listings are made for a particular type system, the material is the Installer's option.

2.4 Wet Pipe: Seamless ERW black steel pipe; Schedule 40 for less than 8"; Schedule 30 for 8" and larger. Fittings and joints shall be as follows.

1 Class 125, cast-iron threaded fittings with threaded joints.

2 Mechanical grooved pipe coupling and fittings; cut-groove type with mechanical joints.

3 Wrought steel butt welding fittings with welded joints.

2.4.1 Wet Pipe: Seamless or ERW black steel pipe; Schedule 10 for 5" and smaller; 0.134" wall thickness for 6"; and 0.188" wall thickness for 8" and 10". Allied XL piping is also acceptable.

1 Class 125, cast-iron threaded fittings with threaded joints, sizes 2½" and larger.

2 Mechanical grooved pipe couplings and fittings; roll-groove or mechanical locking type with mechanical joints.

3 Wrought steel butt welding fittings with welded joints.

2.4.2 Wet Pipe: Seamless or ERW black steel pipe; Schedule 7.

1 Class 125, cast-iron threaded fittings with threaded joints, sizes 2½" and larger.

2 Mechanical grooved pipe couplings and fittings; roll-groove or mechanical locking type with mechanical joints.

2.4.3 Wet Pipe: CPVC specifically manufactured and UL-listed for fire protection service. Use in accordance with its listing.

2.4.4 Fire Pump Suction: Seamless ERW galvanized steel pipe, Schedule 40.

1 Class 150 malleable iron galvanized threaded fittings.

- 2 Mechanical grooved pipe couplings and fittings; roll-groove or mechanical locking type with mechanical joints.
- 2.4.5 High Pressure System: Where system pressure exceeds 175 psig as shown on the drawings at fire pump discharge and jockey pump discharge, provide fittings with a rating suitable for the service.
- 1 Class 300, cast-iron threaded fittings with threaded joints.
- 2 Mechanical grooved pipe couplings and fittings; roll-groove or mechanical locking type with mechanical joints.
- 2.5 Basic Piping Specialties: Provide piping specialties complying with Division-23 Basic Mechanical Materials and Methods section "Piping Specialties".
- 2.6 Basic Supports and Anchors: Provide supports and anchors complying with Division-23 Basic Mechanical Materials and Methods section "Supports and Anchors", in accordance with the following listing:
- Adjustable steel clevis hangers or adjustable steel band hangers for horizontal-piping hangers and supports.
- Two-bolt riser clamps for vertical piping supports.
- Steel turnbuckles and malleable iron sockets for hanger-rod attachments.
- Concrete inserts, top-beam C-clamps, side beam or channel clamps or center beam clamps for building attachments.
- 2.7 Basic Valves: Provide interior valves complying with Division-23 Basic Mechanical Materials and Methods section "Valves", in accordance with the following listing:
- 2.7.1 Standard Service Code-Required OS&Y Valves: GA-6, GA-7.
- 2.7.2 Standard Service Sectional Valves: GA-6, GA-7. BF-6, BF-7.
- 2.7.3 Standard Service Indicating Valves: GA-6, GA-7, BA-6.
- 2.7.4 Standard Service Trim Valves: GA-6, BA-4.
- 2.7.5 Standard Service Check Valves: CK-4, CK-5.
- 2.7.6 High Pressure Service Code Required OS&Y Valves: GA-12.
- 2.7.7 High Pressure Service Sectional Valves: GA-12.
- 2.7.8 High Pressure Service Indicating Valves: GA-12, BA-6.
- 2.7.9 High Pressure Service Trim Valves: GA-10, BA-5.

- 2.7.10 High Pressure Service Check Valves: CK-4, CK-7.
- 2.8 Special Valves:
- 2.8.1 General: Provide valves, UL listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.
- 2.8.2 Alarm Check Valve: Provide cast-iron water flow alarm check valve, 175 psi working pressure, with retard chamber.
- 2.8.3 Acceptable Manufacturers: Subject to compliance with requirements, provide valves of one of the following:
- Grinnell Fire Protection Systems Co., Inc.
Grunau Sprinkler Mfr. Co., Inc.
Reliable
Viking Corporation
- 2.9 Basic Meters and Gauges: Provide meters and gauges complying with Division-23 Basic Mechanical Materials and Methods section "Meters and Gauges", in accordance with the following listing:
- 2.9.1 Pressure gauges, 0-250 psi range.
- 2.9.2 Fire Protection Specialties: Provide fire protection specialties, UL listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.
- 2.9.3 Water Flow Indicators: Provide vane type water flow switches, with adjustable retard.
- 2.9.4 Supervisory Switches: Provide products recommended by manufacturer for use in service indicated.
- 2.10 Automatic Sprinklers: Provide automatic sprinklers and escutcheons of type indicated on drawings, and in accordance with the following listing. Provide quick response type automatic sprinklers. Provide fusible links for 165°F unless otherwise indicated.
- 2.10.1 Sprinkler Types
- Upright.
Pendent.
Pendant with two-piece escutcheon assembly
Recessed pendent.
Concealed pendent.
Horizontal sidewall.
Vertical sidewall.
Recessed dry-type pendent.
Concealed dry-type pendent.

- 2.10.2 Finish: White chrome-plated for recessed concealed heads in occupied areas. Chrome-plated for pendant heads in occupied areas. Cast brass for unoccupied areas.
- 2.10.3 Sprinkler Cabinet and Wrench: Furnish steel, baked red enameled, sprinkler box with capacity to store 10 sprinklers and wrench sized to sprinklers.
- 2.10.4 Acceptable Manufacturers: Subject to compliance with requirements, provide automatic sprinklers of one of the following:
- Central Sprinkler Corp.
Grinnell Fire Protection Systems Co., Inc.
Star Sprinkler Mfg. Co. Inc.
Reliable
Viking Corp.

3 EXECUTION

- 3.1 General: Examine areas and conditions under which fire protection materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer. Any installation, modification, or alteration of the sprinkler system shall be performed only by a person under a certificate of competency issued by the State Fire Marshal.
- 3.2 Installation of Basic Identification: Install mechanical identification in accordance with Division-23 Basic Mechanical Materials and Methods section "Mechanical Identification." Install fire protection signs on piping in accordance with NFPA 13 and NFPA 14 requirements. Continuously paint exposed fire piping red in mechanical and electrical rooms.
- 3.3 Installation of Pipes and Pipe Fittings:
- 3.3.1 General: Install pipes and pipe fittings in accordance with Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings."
- 3.3.2 Comply with requirements of NFPA 13 for installation of fire protection piping materials. Install piping products where indicated, in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that piping systems comply with requirements and serve intended purposes.
- 3.3.3 Coordinate with other work as necessary to interface components of fire protection piping properly with other work.
- 3.3.4 Install drain piping at low points of piping system. Provide dry drum drips where indicated.
- 3.3.5 Install hose outlet valves in piping where hose outlets are indicated.
- 3.3.6 Install sectional valves in inlet piping, at bottom of each riser, and in loops as indicated.
- 3.3.7 Install water flow indicators where indicated.
- 3.3.8 Mount supervisory switches on each sectional valve.

- 3.3.9 Install manual shutoff at each audible alarm station.
- 3.3.10 Install valved hose connections of sizes indicated, or ¾" size if not otherwise indicated, on sprinkler at ends of branch lines and cross mains and at locations where indicated. The intent is to meet the requirements of NFPA 13 and to achieve a fully drainable system.
- 3.3.13 Install Inspector's test connection where indicated, or at most remote point from riser.
- 3.4 Installation of Piping Specialties: Install piping specialties in accordance with Division-23 Basic Mechanical Materials and Methods section "Piping Specialties."
- 3.5 Installation of Supports and Anchors: Install supports and anchors, in accordance with Division-23 Basic Mechanical Materials and Methods section, "Supports and Anchors."
- 3.6 Installation of Valves: Install valves in accordance with Division-23 Basic Materials and Methods section "Valves." Provide valves to isolate each riser and elsewhere as required by NFPA 13 and 14 .
- 3.7 Installation of Meters and Gauges: Install meters and gauges in accordance with Division-23 Basic Mechanical Materials and Methods section "Meters and Gauges."
- 3.8 Installation of Fire Protection Specialties: Install fire protection specialties as indicated, and in accordance with NFPA 13. Furnish wiring requirements to electrical Installer for electrical wiring of supervisory switches.
- 3.9 Field Quality Control:
- 3.9.1 Sprinkler Piping Flushing: Prior to connecting sprinkler risers for flushing, flush feed mains, lead-in connections and control portions of sprinkler piping. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in NFPA 13. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.
- 3.9.2 Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically, for period of 24 hours, at not less than 200 psi or at 50 psi in excess of maximum static pressure when maximum static pressure is in excess of 150 psi. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested.
- 3.9.3 Repair or replace piping system as required to eliminate leakage in accordance with NFPA standards for "little or no leakage" and retest as specified to demonstrate compliance.
- 3.10 Cleaning and Inspecting: Clean and inspect fire protection systems in accordance with requirements of Division-23 Basic Mechanical Materials and Methods section "Testing, Cleaning, and Sterilization of Piping Systems".
- 3.11 Extra Stock:
- 3.11.1 Heads: For each style and temperature range required, furnish additional sprinkler heads,

amounting to one unit for every 100 installed units, but not less than 5 units of each.

- 3.11.2 Wrenches: Furnish 2 spanner wrenches for each type and size of valve connection and fire hose coupling. Obtain receipt from Owner that extra stock has been received.
- 3.12 Owner Instruction: Provide technical services for one 4-hour period to instruct Owner's personnel in operation and maintenance of building sprinkler systems. Schedule training date with Owner. Provide at least 7-day notice to Engineer and Owner of training date.

END OF SECTION 21 13 00

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 22 01 00 - PLUMBING GENERAL

1 GENERAL

1.1 The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the plumbing work as herein called for and shown on the drawings.

1.2 Related Documents:

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

1.2.2 This is a Basic Plumbing Requirements Section. Provisions of this section apply to work of all Division 22 sections.

1.2.3 Provisions of Division-23 Basic Mechanical Requirements apply to work of all Division 22 sections.

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

1.2.5 Definitions:

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

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

1.2.5.3 Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.3 Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.4 Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided 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 acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said data.

1.5 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 protection from the weather and accidental damage.

- 1.6 Extent of work is indicated by the drawings, schedules, and the requirements of the specifications. Singular references shall not be constructed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.
- 1.7 Field Measurements and Coordination:
- 1.7.1 The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.
- 1.7.2 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 dimension and locations.
- 1.7.3 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.
- 1.7.4 Locate all apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on plumbing drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.
- 1.7.5 Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval.
- 1.7.6 Carefully examine any existing conditions, piping, and premises. Compare drawings with existing 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 instructions will be issued to resolve discrepancies.
- 1.7.7 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 perform 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 encroach on space assigned to another use.
- 1.8 Guarantee:
- 1.8.1 The Contractor shall guarantee labor, materials and equipment for a period of one (1) year from Final Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.

- 1.8.2 Owner reserves right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.
- 1.9 Approval Submittals:
- 1.9.1 When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.
- 1.9.1.1 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.
- 1.9.1.1.1 Submittals shall be properly organized in accordance with the approved submittal control log.
- 1.9.1.1.2 Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.
- 1.9.1.1.3 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.
- 1.9.1.1.4 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.
- 1.9.1.1.5 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.
- 1.9.1.1.6 The electrical design shown on the drawings supports the plumbing equipment basis of design specifications at the time of design. If plumbing equipment is submitted with different electrical requirements, it is the responsibility of the plumbing 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 plumbing submittal with a written statement that this change will be provided at no additional cost. Plumbing 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.
- 1.9.2 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 writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.
- 1.9.3 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.

- 1.9.4 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 installation. 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.
- 1.10 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 documentation 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.
- 1.11 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.

2 PRODUCTS

- 2.1 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.
- 2.2 Equipment and Materials:
- 2.2.1 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.
- 2.2.2 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.
- 2.2.3 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.
- 2.2.4 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.

- 2.2.5 A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.
- 2.2.6 Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.
- 2.2.7 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.
- 2.2.8 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.
- 2.2.9 All equipment and material shall be manufactured and assembled in the United States.
- 2.3 Requests for Substitution:
- 2.3.1 Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified.
- 2.3.2 Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.
- 2.3.2.1 Required product cannot be supplied in time for compliance with Contract time requirements.
- 2.3.2.2 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.
- 2.3.2.3 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.
- 2.3.3 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:
- Principal of operation.
 Materials of construction or finishes.
 Thickness of gauge of materials.
 Weight of item.
 Deleted features or items.
 Added features or items.

Changes in other work caused by the substitution.
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.

3 EXECUTION

3.1 Workmanship: 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.

3.2 Coordination:

3.2.1 The Contractor shall be responsible for full coordination of the plumbing 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.

3.2.2 Any additional steel supports required for the installation of any plumbing equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.

3.2.3 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.

3.2.4 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.

3.2.5 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.

3.2.6 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.

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

3.3 Interruption of Service: 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.

- 3.4 Phasing: 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.
- 3.5 Cutting and Patching: 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.
- 3.6 Equipment Setting: Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.
- 3.7 Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 22. 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 required.
- 3.8 Clean-up: 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.
- 3.9 Start-up and Operational Test: 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.
- 3.10 Record Drawings:
- 3.10.1 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.
- 3.10.2 Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.
- 3.11 Acceptance:
- 3.11.1 Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.
- 3.11.2 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.
- 3.11.3 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:

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

3.11.4 Record Drawings: Submit record drawings.

3.11.5 Control Diagrams: Frame under glass and mount on equipment room wall.

END OF SECTION 22 01 00

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SECTION 22 05 73 - EXCAVATION & BACKFILL

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-22 Basic Plumbing Materials and Methods section, and is part of each Division-22 section making reference to or requiring excavation and backfill specified herein.
- 1.3 Existing Utilities: Underground utilities shown were taken from old drawings. The exact location of these utilities and irrigation branches and abandoned services are not known. Use extreme caution when excavating.
- 1.4 Refer to other Division-22 sections and/or drawings for specific requirements of the particular piping system being installed. Where another Division-22 section or the drawings conflict with requirements of this section, the other Division-22 section or the drawings shall take precedence over the general requirements herein.
- 1.5 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.
- 1.6 Trench Safety Act: Contractor shall comply with all requirements of Florida Statutes Chapter 553, including the requirement to provide a separate line item to identify the cost to comply on a per lineal foot of trench and per square foot of shoring.

2 PRODUCTS

- 2.1 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.
- 2.2 Gravel: Clean, well graded hard stone or gravel, free from organic material. Size range to be from No. 4 screen retentions to 1".
- 2.3 Earth: Fill free of clay, muck, stones, wood, roots or rubbish.
- 2.4 Identification Tape: Polyethylene 6 inches wide, 0.004 inches thick, continuously printed with "CAUTION" in large letters and type of pipe below.
- 2.5 Copper Identification Wire: 14-gauge.

3 EXECUTION

- 3.1 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.

- 3.2 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 (as described in paragraph 2.1), 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.
- 3.3 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.
- 3.4 Backfilling: Deposit clean new sand (as described in paragraph 2.1) 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.
- 3.5 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.
- 3.6 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.
- 3.7 Depth of Cover: Minimum cover for underground piping is two feet unless indicated otherwise.
- 3.8 Existing Pavement: Where new piping passes below existing streets, driveways, parking lots, or other paved areas, the pavement shall be saw cut. Backfill shall be compacted to 95% density and the pavement shall be patched to match existing pavement. Provide compaction tests and reports as required.
- 3.9 Landscape Restoration:
- 3.9.1 Lawn or Unpaved Areas: The soil shall be replaced according to the original profile. Compact the top 6" of subgrade and each 6" layer of backfill or fill material at 85% maximum density for cohesive soils and 90% relative density for cohesionless soils.

If additional soil is required, the Contractor shall supply weed free topsoil of a type to match existing topsoil.

END OF SECTION 22 05 63

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SECTION 22 11 13 - POTABLE WATER SYSTEM

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-22 Basic Plumbing Requirements and Basic Plumbing Materials and Methods sections apply to work of this section.
- 1.3 Extent of potable water systems work, is indicated on drawings and schedules, and by requirements of this section.
- 1.4 Refer to other Division-22 sections for site water distribution system; not work of this section unless noted.
- 1.5 Refer to appropriate Division-2 sections for exterior potable water system; not work of this section unless noted.
- 1.6 Insulation for potable water piping is specified in other Division-22 sections, and is included as work of this section. Insulation requirements include:
- 1.6.1 Domestic hot water piping
- 1.6.2 Cold water piping above ceilings and/or in attics.
- 1.7 Excavation and backfill required in conjunction with water piping is specified in other Division-22 sections, and is included as work of this section.
- 1.8 Code Compliance: Comply with applicable portions of Florida Building Code-Plumbing pertaining to selection and installation of plumbing materials and products. Comply with local utility requirements.
- 1.9 Approval Submittals:
- 1.9.1 Product Data: Submit manufacturer's technical product data and installation instructions for:
- Valves
Access doors
- 1.10 Test Reports and Verification Submittals:
- 1.10.1 Backflow Preventer Test Report: Submit Test Report for each backflow preventer.
- 1.10.2 Disinfection: Submit report by Health Department.

1.11 O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts lists for valves, backflow preventers, pressure regulating valves, trap primers. Include these data in O&M manual.

2 PRODUCTS

2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with Florida Building Code-Plumbing where applicable. Provide sizes and types matching pipe materials used in potable water systems. Where more than one type of materials or products is indicated, selection is Installer's option.

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following listed for each item.

2.3 Identification: Provide identification complying with Division-22 Basic Plumbing Materials and Methods section "Plumbing Identification". Provide manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct burial service; not less than 6" wide x 4 mils thick. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW".

2.4 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

2.4.1 Interior Water Piping:

2.4.1.1 Above Grade: Copper tube; Type L, hard-drawn temper; wrought-copper fittings, solder-joints.

2.4.1.2 Below Grade: Copper tube; Type L, soft-annealed temper; no joints below floor.

2.4.2 Exterior Water Piping:

2.4.2.1 Copper tube; Type L, hard-drawn temper; wrought-copper fittings, solder-joints.

2.4.2.2 Polyvinyl chloride pipe (PVC), Schedule 4080; PVC socket fittings, solvent cement joints.

2.4.3 Solder joints shall be made with 95-5 solder.

2.5 Piping Specialties: Provide piping specialties complying with Division-22 Basic Plumbing Materials and Methods section "Piping Specialties".

2.6 Supports and Anchors: Provide supports and anchors complying with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

2.7 Interior Valves: Provide valves complying with Division-22 Basic Plumbing Materials and Methods section "Valves", in accordance with the following listing:

2.7.1 Sectional and Shutoff Valves: GA1, GA2, GA3, BA1, BA2.

- 2.7.2 Drain Valves: GA1, GA2, BA1, BA2.
- 2.7.3 Throttling Valves: GL1, GL2, BA1, BA2.
- 2.7.4 Check Valves: CK1, CK2, CK3.
- 2.8 Exterior Valves: Provide as indicated, gate valves, AWWA C500, 175 psi working pressure. Provide threaded, flanged, hub, or other end configurations to suit size of valve and piping connections. Provide inside screw type for use with curb valve box, iron body, bronze-mounted, double disc, parallel seat, non-rising stem. Clow Corp., Dresser Mfg., Fairbanks Co., Kennedy, Stockham.
- 2.9 Access Doors: Provide access doors to service all valves and other devices as required in accordance with Division-22 Basic Materials and Methods Section "Access Doors".

3 EXECUTION

- 3.1 General: Examine areas and conditions under which potable water systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- 3.2 Install plumbing identification in accordance with Division-22 Basic Plumbing Materials and Methods section "Plumbing Identification". Install underground plastic pipe markers during backfill, 6"-8" below grade.
- 3.3 Install water distribution piping in accordance with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings".
- 3.3.1 Install piping with 1/32" per foot (1/4%) downward slope towards drain point.
- 3.3.2 Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.
- 3.4 Install exterior water piping in compliance with local governing regulations. Water piping shall be installed with a minimum of 30 inches of cover unless otherwise indicated.
- 3.5 Install piping specialties in accordance with Division-22 Basic Plumbing Materials and Methods section "Piping Specialties".
- 3.6 Install supports and anchors in accordance with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".
- 3.7 Install valves in accordance with Division-22 Basic Plumbing Materials and Methods section "Valves".
- 3.7.1 Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves two or more plumbing fixtures or equipment connections, and elsewhere as indicated.
- 3.7.2 Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.

- 3.7.3 Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain potable water system.
- 3.8 Install water hammer arresters in upright position, in locations and of sizes indicated in accordance with PDI Standard WH-201.
- 3.9 Locate and coordinate installation of access doors for all valves and devices in accordance with Division-22 Basic Plumbing Materials and Methods section "Access Doors".
- 3.10 Piping Tests: Test, clean, and sterilize potable water piping in accordance with testing requirements of Division-22 Basic Plumbing Materials and Methods section "Testing, Cleaning, and Sterilization of Piping Systems".

END OF SECTION 22 11 13

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SECTION 22 11 23 - PLUMBING PUMPS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-23 Basic Materials and Methods sections apply to work of this section.
- 1.3 Extent of plumbing pumps work required by this section is indicated on drawings, and by requirements of this section.
- 1.4 Refer to Division-26 sections for the following work; not work of this section.
- 1.4.1 Power supply wiring from power source to power connection on pumps. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory installed, by manufacturer.
- 1.4.2 Interlock wiring between pumps; and between pumps and field-installed control devices.
- 1.5 Codes and Standards: Provide electric motors and components which are listed and labeled by UL and comply with NEMA standards.
- 1.6 Approval Submittals:
- 1.6.1 Product Data: Submit manufacturer's pump specifications, dimensions, weights, required clearances, installation and start-up instructions. Submit current accurate pump characteristic performance curves with selection points clearly indicated. Submit product data for:
- Pedestal Type Sump Pumps
Submersible Sump Pumps
- 1.7 O&M Data Submittals:
- 1.7.1 Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to plumbing pumps. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- 1.7.2 O&M Data: Submit a copy of approval submittals and maintenance data and parts lists for each type of pump, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data and wiring diagrams in O&M manual.

2 PRODUCTS

- 2.1 General: Provide factory-tested pumps, thoroughly cleaned and painted with one coat of

machinery enamel prior to shipment. Provide high efficiency motors in accordance with Division-23 section "Motors". Type, size, and capacity of each pump is listed in schedules on the drawings. Provide pumps of same type by same manufacturer.

2.2 Pedestal Type Sump Pumps:

2.2.1 General: Provide pedestal type sump pumps as indicated, of size and capacity as indicated.

2.2.2 Pump: Centrifugal, semi-open impeller type sump pump, complete with galvanized-steel strainer, cast-iron base plate, suction plate and casing, and cast-iron or bronze impeller.

2.2.3 Shaft: Stainless steel of length to suit depth of basin, connected with flexible coupling to motor, and intermediate sleeve bearing for lengths over 4'.

2.2.4 Motor: Open drip-proof, electrical characteristics as indicated.

2.2.5 Basin: Fiberglass construction of indicated dimensions, with inlet connections of size and location as indicated. Maintain minimum of 3' depth below lowest inlet invert.

2.2.6 Cover: Cast-iron or steel circular cover with manhole or handhole opening, depending on diameter. Provide openings for pump, control rod, and discharge piping.

2.2.7 Controls: Provide NEMA 2 motor-mounted float switch complete with float, float rod, and rod buttons.

2.2.8 Acceptable Manufacturers: Subject to compliance with requirements, provide pedestal type sump pumps of one of the following:

Armstrong Pumps, Inc.
Aurora Pump.
Peerless Pump.
Weil Pump Co.

2.3 Submersible Sump Pumps:

2.3.1 General: Provide submersible sump pumps as indicated, of size and capacity as indicated.

2.3.2 Pump: Cast-iron shell, bronze impeller, stainless steel shaft, factory-sealed grease lubricated ball bearings, ceramic mechanical seal, and perforated steel strainer.

2.3.3 Motor: Hermetically sealed, capacitor-start, with built-in overload protection, electrical characteristics as indicated. Provide 10' of 3-conductor PVC cord and molded grounding plug.

2.3.4 Controls: Float-operated mercury switch.

2.3.5 Acceptable Manufacturers: Subject to compliance with requirements, provide submersible sump pumps of one of the following:

Aurora Pump.
Goulds Pumps, Inc.
Weil Pump Co.

2.4 Vibration Isolators: Provide vibration isolators in accordance with Division-23 section "Vibration Isolation" and the following listing:

2.4.1 Unit Mounting: Type EM5.

2.4.2 Piping: Type PF5.

3 EXECUTION

3.1 Examine areas and conditions under which plumbing pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 General: Install plumbing pumps where indicated, in accordance with manufacturer's published installation instructions, complying with recognized industry practices to ensure that plumbing pumps comply with requirements and serve intended purposes.

3.3 Access: Provide access space around plumbing pumps for service as indicated, but in no case less than that recommended by manufacturer.

3.4 Base-Mounted Pump Support: Install pumps on reinforced concrete base equal or greater than 3 times total weight of pump and motor, with anchor bolts poured in place. Set and level pump, grout under pump base with non-shrink grout.

3.5 In-Line Pump Support: Install pumps supported from piping system.

3.6 Basins: Install sump pump basins in indicated locations and connect to sewer inlets. Brace interior of basin in accordance with manufacturer's instructions, to prevent distortion or collapse during concrete placement. Refer to Division 3 for concrete work; not work of this section. Set cover over basin, fasten to top flange of basin. Install so cover is flush with finished floor.

3.7 Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.8 Piping Connections: Refer to Division-22 plumbing piping sections. Provide piping, valves, accessories, gauges, supports, and flexible connections as indicated.

3.8.1 Install strainer on inlet and shut-off valves on inlet and outlet of recirculation pumps.

3.8.2 Install check valve in rise from sump pumps.

3.9 Alignment: Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer.

- 3.10 Start-Up: Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.
- 3.11 Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 22 11 23

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SECTION 22 13 16 - SOIL, WASTE AND VENT SYSTEM

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-22 Basic Plumbing Requirements and Basic Plumbing Materials and Methods sections apply to work of this section.
- 1.3 Extent of soil waste and vent systems work is indicated on drawings and schedules, and by requirements of this section.
- 1.4 Refer to appropriate Division-2 sections for exterior sanitary sewer system required in conjunction with soil and waste systems; not work of this section.
- 1.5 Insulation for soil and waste systems is specified in other Division-22 sections, and is included as work of this section. Insulation requirements include:
 - 1.5.1 Horizontal above grade waste pipes receiving discharge from ice machines, coolers, freezers or similar units to points of connection receiving waste from 4 or more fixtures.
 - 1.5.2 Horizontal above grade waste pipes receiving condensate from air conditioning equipment to point of connection receiving waste from 4 or more fixtures.
- 1.6 Excavation and backfill required in conjunction with soil, waste and vent piping is specified in other Division-22 sections and is included as work of this section.
- 1.7 Refer to Division-7 section "Flashing and Sheet Metal" for flashings required in conjunction with soil and waste systems; not work of this section.
- 1.8 Code Compliance: Comply with applicable portions of Florida Building Code-Plumbing pertaining to plumbing materials, construction and installation of products. Comply with local utility requirements.
- 1.9 Approval Submittals:
 - 1.9.1 Product Data: Submit manufacturer's technical product data for:

Cleanouts
 - 1.10 O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts lists for oil separators and backwater valves. Include these data in O&M manual.

2 PRODUCTS

2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in soil and waste systems. Where more than one type of materials or products is indicated, selection is Installer's option.

Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following listed for each item.

2.3 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

2.3.1 Above Ground Soil, Waste, and Vent Piping:

2.3.1.1 Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fitting, solvent cement joints. Do not use in fire-rated assemblies or return air plenums.

2.3.2 Underground Building Drain Piping (within 5 feet of the building):

2.3.2.1 Pipe Size 6" and Smaller: Polyvinyl chloride sewer pipe (PVC); Type DWV; PVC plastic type DWV socket-type.

2.3.3 Site Sanitary Piping (over 5 feet from the building):

2.3.3.1 Polyvinyl chloride sewer pipe (PVC); standard weight; PVC sewer pipe fittings with elastomeric joints.

2.4 Pipe Specialties: Provide piping specialties complying with Division-22 Basic Materials and Methods section "Piping Specialties".

2.5 Supports and Anchors: Provide supports and anchors complying with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

2.6 Cleanouts: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations. Josam, Jay R. Smith, Wade, Zurn.

2.6.1 Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1 countersunk head.

2.6.2 Cleanout for PVC Systems:

2.6.2.1 Floor Cleanouts: Cast-iron body with adjustable head, brass plug, and scoriated nick-brass cover. Furnish with carpet flange for carpeted floors. Furnish with recessed cover for tile floors. Furnish with clamping ring for floors with membrane. Wade W-6030 hub outlet for push-on.

- 2.6.2.2 Cleanouts in Piping: PVC cleanout adaptor with threaded PVC plug.
- 2.6.2.3 Wall Cleanouts: PVC cleanout adaptor with tapped, countersunk, threaded brass plug. Square 8.75"x8.75" hinged wall access cover, with scoriated nickel bronze finish.
- 2.6.2.4 Grade Cleanouts: PVC cleanout adaptor with countersunk, threaded brass plug. Wade W-8590-D plug. In sidewalks and other finished concrete, provide access cover frames with a non-tilting tractor cover. Wade W-7035-Z or equal.
- 2.6.2.5 Cleanouts in Paved Areas: Cast iron body, adjustable housing, ferrule with plug and round loose scoriated tractor cover. Wade W-8300-MF. Coordinate concrete depth at site with adjustable flange.

3 EXECUTION

- 3.1 Examine substrates and conditions under which soil and waste systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- 3.2 Piping Installation:
 - 3.2.1 Install above grade soil and waste piping in accordance with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings", and with Florida Building Code-Plumbing.
 - 3.2.2 Install underground soil and waste pipes as indicated and in accordance with Florida Building Code-Plumbing. Lay underground piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.
 - 3.2.3 Install building soil and vent piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping smaller than 3", and 1/8" per foot (1%) for piping 3" and larger.
- 3.3 Install piping specialties in accordance with Division-22 Basic Plumbing Materials and Methods section "Piping Specialties".
- 3.4 Install supports and anchors in accordance with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".
- 3.5 Installation of Cleanouts: Install in above ground piping and building drain piping as indicated, as required by Florida Building Code-Plumbing; and at each change in direction of piping greater than 45°; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.
 - 3.5.1 Size: Cleanouts shall be full size up to 4". Piping over 4" shall have a reducing fitting to accommodate a 4" cleanout unless indicated otherwise on drawings.

- 3.5.2 Install cleanouts to allow adequate clearance for rodding.
- 3.5.3 Protect all finished surfaces of cleanouts with a suitable adhesive covering until construction is completed.
- 3.5.4 Cleanouts to Grade: Provide an 18" x 18" x 8" thick concrete pad around the cleanout. Set the cleanout ferrule, adapter, or access cover frame in the concrete as required. The cleanout shall be extended to the finished grade. The concrete pad shall slope away from the cleanout in all directions approximately one inch. Cover pad with fill to finished grade.
- 3.5.5 Cleanouts in Paved Areas: Provide concrete pad similar to cleanout to grade and coordinate concrete depth at site with adjustable flange. Access cover frames are required.
- 3.6 Test, clean, flush, and inspect soil and waste piping in accordance with requirements of Division-22 Basic Plumbing Materials and Methods section "Testing, Cleaning and Sterilization of Piping Systems".

END OF SECTION 22 13 16

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SECTION 23 01 00 - MECHANICAL GENERAL

1 GENERAL

1.1 The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2 Related Documents:

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

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

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

1.2.4 Definitions:

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

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

1.2.4.3 Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.3 Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.4 Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided 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 acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said data.

1.5 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 protection from the weather and accidental damage.

1.6 Extent of work is indicated by the drawings, schedules, and the requirements of the specifications. Singular references shall not be constructed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.

1.7 Field Measurements and Coordination:

- 1.7.1 The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.
- 1.7.2 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 dimension and locations.
- 1.7.3 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.
- 1.7.4 Locate all apparatus symmetrical with architectural elements. Install to exact height and locations 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.
- 1.7.5 Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval.
- 1.7.6 Carefully examine any existing conditions, piping, and premises. Compare drawings with existing 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 instructions will be issued to resolve discrepancies.
- 1.7.7 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 perform 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 encroach on space assigned to another use.

1.8 Guarantee:

- 1.8.1 The Contractor shall guarantee labor, materials and equipment for a period of *five ~~one~~ (± 5)* years from Final Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.
- 1.8.2 Owner reserves right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.9 Approval Submittals:

- 1.9.1 When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.
- 1.9.1.1 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.
- 1.9.1.1.1 Submittals shall be properly organized in accordance with the approved submittal control log.
- 1.9.1.1.2 Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.
- 1.9.1.1.3 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.
- 1.9.1.1.4 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.
- 1.9.1.1.5 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.
- 1.9.1.1.6 The electrical 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 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 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.
- 1.9.2 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 writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.
- 1.9.3 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.

- 1.9.4 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 installation. 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.
- 1.10 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 documentation 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.
- 1.11 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.

2 PRODUCTS

- 2.1 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.
- 2.2 Equipment and Materials:
- 2.2.1 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.
- 2.2.2 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.
- 2.2.3 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.
- 2.2.4 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.
- 2.2.5 A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

- 2.2.6 Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.
- 2.2.7 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.
- 2.2.8 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.
- 2.3 Requests for Substitution:
- 2.3.1 Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified.
- 2.3.2 Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.
- 2.3.2.1 Required product cannot be supplied in time for compliance with Contract time requirements.
- 2.3.2.2 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.
- 2.3.2.3 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.
- 2.3.3 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:
- Principal of operation.
 - Materials of construction or finishes.
 - Thickness of gauge of materials.
 - Weight of item.
 - Deleted features or items.
 - Added features or items.
 - Changes in other work caused by the substitution.
 - 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.

3 EXECUTION

3.1 Workmanship: 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.

3.2 Coordination:

3.2.1 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.

3.2.2 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.

3.2.3 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.

3.2.4 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.

3.2.5 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.

3.2.6 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.

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

3.3 Interruption of Service: 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.

3.4 Phasing: 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.

- 3.5 Cutting and Patching: 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.
- 3.6 Equipment Setting: Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.
- 3.7 Painting: 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 required.
- 3.8 Clean-up: 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.
- 3.9 Start-up and Operational Test: 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.
- 3.10 Climate Control: 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.
- 3.11 Record Drawings:
- 3.11.1 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.
- 3.11.2 Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.
- 3.12 Acceptance:
- 3.12.1 Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.
- 3.12.2 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.
- 3.12.3 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:
- Detailed operating instructions and instructions for making minor adjustments.
Complete wiring and control diagrams.

Routine maintenance operations.

Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.

Copies of approved submittals.

Copies of all manufacturer's warranties.

Copies of test reports and verification submittals.

- 3.12.4 Record Drawings: Submit record drawings.
- 3.12.5 Test and Balance Report: Submit four certified copies. The Report shall be submitted for review prior to the Substantial Completion Inspection unless otherwise required by Division 1.
- 3.12.6 Acceptance will be made on the basis of tests and inspections of job. A representative of firm that performed test and balance work shall be in attendance to assist. Contractor shall furnish necessary mechanics to operate system, make any necessary adjustments and assist with final inspection.
- 3.12.7 Control Diagrams: Frame under glass and mount on equipment room wall.

END OF SECTION 230100

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 05 19 - METERS AND GAUGES

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-23 Basic Mechanical Materials and Methods section, and is part of each Division-23 section making reference to or requiring meters and gauges specified herein.
- 1.3 Extent of meters and gauges required by this section is indicated on drawings and/or specified in other Division-23 sections.
- 1.4 UL Compliance: Comply with applicable UL standards pertaining to meters and gauges.
- 1.5 ANSI and ISA Compliance: Comply with applicable portions of ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.
- 1.6 Approval Submittals:
 - 1.6.1 Product Data: When required by other Division-23 sections, submit manufacturer's technical product data for each type of meter and gauge. Submit with Division-23 section using meters and gauges, not as a separate submittal. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit for:

- Thermometers
- Pressure gauges
- Gauge connector plugs
- Automatic balancing valves

- 1.7 O&M Data Submittals: Submit a copy of approval submittals. Submit calibration curves and operating instructions for each type of meter or gauge. Include this data in O&M Manual.

2 PRODUCTS

- 2.1 Acceptable Manufacturers (Thermometers and Pressure Gauges): Subject to compliance with requirements, Ashcroft, Ernst Gauge Company, Weksler, Marshalltown Instruments, Terrice, Weiss Instruments, Wheatley, Fluidyne or approved equal.
- 2.2 Glass Thermometers:
 - 2.2.1 General: Provide glass thermometers of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
 - 2.2.2 Case: Die cast aluminum finished in baked epoxy enamel, glass front, spring secured, 9" long.

- 2.2.3 Adjustable Joint: Die cast aluminum, finished to match case, 180° adjustment in vertical plane, 360° adjustment in horizontal plane, with locking device.
- 2.2.4 Tube and Capillary: Liquid filled, magnifying lens, 1% scale range accuracy, shock mounted.
- 2.2.5 Scale: Satin faced, non-reflective aluminum, permanently etched markings.
- 2.2.6 Stem: Copper-plated steel or brass for separable socket, length to suit installation.
- 2.2.7 Range: Conform to the following:
 - 2.2.7.1 Hot Water: 30° - 180°F with 2°F scale divisions.
 - 2.2.7.2 Condenser Water: 30° - 180°F with 2°F scale divisions.
- 2.3 Thermometer Wells: Provide thermometer wells constructed of stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping. Provide cap nut with chain fastened permanently to thermometer well if wells do not have a permanent instrument installed. Same manufacturer as thermometers.
- 2.4 Pressure Gauges:
 - 2.4.1 General: Provide pressure gauges of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
 - 2.4.2 Type: General use, 1% accuracy, ANSI B40.1 grade A, phosphor bronze bourdon type, bottom connection.
 - 2.4.3 Case: Drawn steel or brass, glass lens, 4-½" diameter.
 - 2.4.4 Connector: Brass with ¼" male NPT.
 - 2.4.5 Scale: White coated aluminum with black scale.
 - 2.4.6 Range: Select so that highest possible pressure does not exceed 75% of full scale.
- 2.5 Pressure Gauge Cocks:
 - 2.5.1 General: Provide ¼" ball valves for use as pressure gauge cocks.
 - 2.5.2 Snubber: ¼" brass bushing with corrosion resistance porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.
- 2.6 Gauge Connector Plugs:
 - 2.6.1 Provide temperature gauge connector plugs pressure rated for 500 psi and 200°F. Construct of brass and finish in nickel-plate, equip with 1/2" NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/2" O.D. probe assembly from dial type insertion thermometer. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping. Pete's Plug or approved equal.

- 2.6.2 Provide pressure gauge connector plugs pressure rated for 500 psi and 200°F. Construct of brass and finish in nickel-plate, equip with 1/2" NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/2" O.D. probe assembly from dial type insertion pressure gauge. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping. Pete's Plug or approved equal.
- 2.6.3 Provide master test kit with hard plastic case including one 2-1/2" test gauge of suitable range, one gauge adapter probe, and one stem pocket testing thermometer (0°F-220°F).
- 2.7 Automatic Balancing Valves:
 - 2.7.1 General: Provide as indicated, threaded automatic balancing valves equipped with optional valve kits to measure the flow rate. Valves shall utilize a stainless steel flow mechanism that is factory-set with $\pm 5\%$ accuracy. The flow mechanism shall be removable with standard tools to change the flow rate setting. Provide dual hose meter kit. Provide threaded mini's for terminal unit coils and threaded high capacity for air handlers. Provide metal nameplate to indicate flow rate. Provide valves with pre-formed polyurethane insulation suitable for use on heating and cooling systems.
 - 2.7.2 Acceptable Manufacturers: Griswold, Autoflow Products, Bell & Gossett, Flow Design Inc.

3 EXECUTION

3.1 Installation Of Temperature Gauges:

- 3.1.1 General: Install temperature gauges in vertical upright position, and tilt so as to be easily read by observer standing on floor.
- 3.1.2 Locations: Install in the following locations, and elsewhere as indicated:
 - 3.1.2.1 At inlet and outlet of each hydronic coil in air handling units.
 - 3.1.2.2 At inlet and outlet of each hydronic boiler and chiller.
- 3.1.3 Thermometer Wells: Install in piping tee where indicated, in vertical upright position. Thermometers shall have at least 75% of stem in moving fluid.
- 3.1.4 Temperature Gauge Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.2 Installation of Pressure Gauges:

- 3.2.1 General: Install pressure gauges in piping tee with pressure gauge cock, located on pipe at most readable position.
- 3.2.2 Locations: Install in the following locations, and elsewhere as indicated:
 - 3.2.2.1 At suction and discharge of each pump.
 - 3.2.2.2 At discharge of each water pressure reducing valve.

- 3.2.2.3 At inlet and outlet of water cooled condensers and refrigerant cooled chillers.
- 3.2.3 Pressure Gauge Cocks: Install in piping tee with snubber.
- 3.2.4 Pressure Gauge Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.
- 3.3 Installation of Flow Measuring Meters:
 - 3.3.1 General: Install flow measuring meters on piping systems located in accessible locations at most readable position.
 - 3.3.2 Locations: Install in the following locations, and elsewhere as indicated:
- 3.4 Automatic Balancing Valves: Install on piping in accordance with the manufacturer's printed instructions. Verify proper operation over full range of control valve and pump operation.
- 3.5 Adjusting and Cleaning:
 - 3.5.1 Adjusting: Adjust faces of meters and gauges to proper angle for best visibility.
 - 3.5.2 Cleaning: Clean windows of meters and gauges and factory-finished surfaces. Replace cracked or broken windows; repair any scratched or marred surfaces with manufacturer's touch-up paint.

END OF SECTION 230519

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 05 20 - PIPES AND PIPE FITTINGS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-23 Basic Mechanical Materials and Methods section, and is part of each Division-23 section making reference to pipes and pipe fittings specified herein.
- 1.3 Extent of pipes and pipe fittings required by this section is indicated on drawings and/or specified in other Division-23 sections.

1.4 Codes and Standards:

1.4.1 Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work.

1.4.2 Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job-site brazing of piping work.

1.5 Test Report and Verification Submittals:

Submit welding certification for all welding installers.
Submit brazing certification for all brazing installers.

2 PRODUCTS

2.1 Piping Materials: Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.

2.2 Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.3 Piping Materials/Products:

2.3.1 Soldering Materials:

2.3.1.1 Tin-Antimony (95-5) Solder: ASTM B-32, Grade 95TA.

2.3.1.2 Silver-Phosphorus Solder: ASTM B-32, Grade 96TS.

- 2.3.2 Pipe Thread Tape: Teflon tape.
- 2.3.3 Protective Coating: Koppers Bitumastic No. 505 or equal.
- 2.3.4 Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast iron flanges; raised-face for steel flanges, unless otherwise noted.
- 2.3.5 Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials. Materials shall be determined by installer to comply with installation requirements.
- 2.3.6 Brazing Materials: Silver content of not less than 15%. Materials shall be determined by installer to comply with installation requirements.
- 2.4 Copper Tube and Fittings:
 - 2.4.1 Copper Tube:
 - 2.4.1.1 Copper Tube: ASTM B88; Type K or L as indicated for each service; hard-drawn temper unless specifically noted as annealed.
 - 2.4.1.2 ACR Copper Tube: ASTM B280.
 - 2.4.2 Fittings:
 - 2.4.2.1 Wrought-Copper Solder-Joint Fittings: ANSI B16.22.
 - 2.4.2.2 Copper Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.
 - 2.4.2.3 Cast-Copper Flared Tube Fittings: ANSI B16.26.
- 2.5 Steel Pipes and Pipe Fittings
 - 2.5.1 Pipes:
 - 2.5.1.1 Black Steel Pipe: ASTM A-53 or A-120, seamless.
 - 2.5.1.2 Galvanized Steel Pipe: ASTM A-53 or A-120, seamless.
 - 2.5.2 Pipe Fittings:
 - 2.5.2.1 Threaded Cast Iron: ANSI B16.4.
 - 2.5.2.2 Threaded Malleable Iron: ANSI B16.3; plain or galvanized as indicated.
 - 2.5.2.3 Malleable Iron Threaded Unions: ANSI B16.39; selected by installer for proper piping fabrication and service requirements including style, end connections, and metal-to-metal seats (iron, bronze or brass); plain or galvanized as indicated.

- 2.5.2.4 Threaded Pipe Plugs: ANSI B16.14.
- 2.5.2.5 Flanged Cast Iron: ANSI B16.1, including bolting.
- 2.5.2.6 Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing.
- 2.5.2.7 Wrought-Steel Buttwelding Fittings: ANSI B16.9, except ANSI B16.28 for short radius elbows and returns, rated to match connected pipe.
- 2.5.2.8 Pipe Nipples: Fabricated from same pipe as used for connected pipe; except do not use less than schedule 80 pipe where length remaining unthreaded is less than 1 ½ inches, and where pipe size is less than 1 ½ inches, and do not thread nipples full length (no close-nipples).
- 2.6 Plastic Pipes and Fittings:
 - 2.6.1 Pipes:
 - 2.6.1.1 PVC DWV Pipe: ASTM D-2665, Schedule 40.
 - 2.6.2 Fittings:
 - 2.6.2.1 PVC Solvent Cement: ASTM D-2564.
 - 2.6.2.2 PVC DWV Socket: ASTM D-2665.
- 3 EXECUTION
 - 3.1 Installation
 - 3.1.1 General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently-leak proof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance or replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings, not bushings. Align piping accurately at connections, within 1/16" misalignment tolerance.
 - 3.1.2 Comply with ANSI B31 Code for Pressure Piping.
 - 3.1.3 Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to ½" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation.
 - 3.1.4 Concealed Piping: Unless specifically noted as "Exposed" on the drawings, conceal piping from view in finished and occupied spaces, by locating in column enclosures, chases, in

hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.

- 3.1.5 Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical, communications, or data equipment spaces and enclosures unless shown. Install drip pan under piping that must run through electrical spaces.
- 3.1.5.1 Cut pipe from measurements taken at the site, not from drawings. Keep pipes free of contact with building construction and installed work.
- 3.2 Piping System Joints: Provide joints of the type indicated in each piping system.
- 3.2.1 Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply non-acid type solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
- 3.2.2 Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed. Paint exposed threads to retard rusting.
- 3.2.3 Flanged Joints: Match flanges within piping system, and at connection with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets. Bolts shall project 1/8" to 3/8" beyond nut face when tight.
- 3.2.4 Weld pipe joints in accordance with recognized industry practice and as follows. Be guided by ANSI B.31.
- 3.2.4.1 Weld pipe joints only when ambient temperature is above 0°F.
- 3.2.4.2 Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.
- 3.2.4.3 Use pipe clamps or tack-weld joints; 4 welds for pipe sizes to 10". All welds shall be open-butt.
- 3.2.4.4 Build up welds with root pass, followed by filler pass and then a cover pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.
- 3.2.4.5 Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.
- 3.2.4.6 At Installer's option, install forged branch-connection fittings wherever branch pipe is less than 3" and at least two pipe sizes smaller than main pipe indicated; or install regular "T" fitting, Weld-O-Let or equal.

- 3.2.5 Plastic Pipe Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards.
- 3.2.5.1 Solvent-cemented joints shall be made in accordance with ASTM D-2235 and ASTM F-402.
- 3.2.5.2 PVC sewer pipe bell/gasket joints shall be installed in accordance with ASTM D-2321.
- 3.2.6 Braze copper tube-and-fitting joints where indicated, in accordance with ANSI B.31.
- 3.3 Piping Installation
- 3.3.1 Install piping to allow for expansion and contraction.
- 3.3.2 Isolate all copper tubing from steel and concrete by wrapping the pipe at the contact point, and for one inch on each side, with a continuous plastic sleeve. Isolate all copper tubing installed in block walls with a continuous plastic sleeve.
- 3.3.3 Underground Piping:
- 3.3.3.1 Provide plastic tape markers over all underground piping. Provide copper wire over all underground plastic piping outside the building. Locate markers 18" above piping.
- 3.3.3.2 Coat the following underground (uninsulated) pipes with a heavy coat of bitumastic or provide an 8 mil polyvinyl sleeve: black steel pipe, galvanized steel pipe, copper tubing.

END OF SECTION 230520

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 05 21 - PIPING SPECIALTIES

1 GENERAL

- 1.1 Drawings and general provisions of contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-23 Basic Mechanical Materials and Methods section, and is part of each Division-23 section making reference to or requiring piping specialties specified herein.

2 PRODUCTS

- 2.1 General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.
- 2.2 Escutcheons:
 - 2.2.1 General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
 - 2.2.2 Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
 - 2.2.3 Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.
- 2.3 Dielectric Unions: Provide standard products recommended by manufacturer Victaulic Style 47 dielectric waterways for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action and stop corrosion. .
- 2.4 Fire Barrier Penetration Seals:
 - 2.4.1 Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or ductwork in accordance with the requirements of Division 7.
- 2.5 Fabricated Piping Specialties:

- 2.5.1 Drip Pans: Provide drip pans fabricated from corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.
- 2.5.2 Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 2.5.2.1 Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6", 14 gage.
 - 2.5.2.2 Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 - 2.5.2.3 Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
- 2.5.3 Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:
 - 2.5.3.1 Caulking and Sealant: Provide foam or caulking and sealant compatible with piping materials used.
- 2.6 Low Pressure Y-Type Pipeline Strainers:
 - 2.6.1 General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Provide Type 304 stainless steel screens.
 - 2.6.1.1 Water Strainers: Select for 200 psi working pressure (water, oil or gas). Provide 20 mesh screens through 2" size and 1/16" perforations for 2 1/2" size and larger.
 - 2.6.2 Select from the following types:
 - 2.6.2.1 Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
 - 2.6.2.2 Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 2.6.2.3 Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
- 3 EXECUTION
 - 3.1 Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.
 - 3.2 Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

- 3.3 Fire Barrier Penetration Seals: Provide pipe sleeve as required. Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions. Refer to Division 7.
- 3.4 Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.
- 3.5 Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves ¼" above level floor finish, and ¾" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
- 3.5.1 Install sleeves in fire-rated assemblies in accordance with the listing of the assembly and the fire barrier sealant.
- 3.5.2 Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings. Fill annular space with caulking or fire barrier sealant as required.
- 3.5.3 Install steel-pipe sleeves at floor penetrations. Fill annular space with caulking or fire barrier sealant as required.
- 3.5.4 Install iron-pipe sleeves at all foundation wall penetrations and at exterior penetrations; both above and below grade. Fill annular space with caulking or mechanical sleeve seals.
- 3.6 Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers ¾" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.
- 3.7 Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:
- Pumps
 - Temperature control valves.
 - Pressure reducing valves.
 - Temperature or pressure regulating valves.

END OF SECTION 230521

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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SECTION 23 05 23 - VALVES

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.
- 1.2 This section is a Division-23 Basic Materials and Methods section, and is part of each Division-23 section making reference to or requiring valves specified herein.
- 1.3 Extent of valves required by this section is indicated on drawings and/or specified in other Division-23 sections.
- 1.4 Quality Assurance:
- 1.4.1 Valve Dimensions: For face-to-face and end-to-end dimensions of flanged or welding-end valve bodies, comply with ANSI B16.10.
- 1.4.2 Valve Types: Provide valves of same type by same manufacturer.
- 1.4.3 Valve Listing: For valves on fire protection piping, provide UL listing.
- 1.4.4 Valves Installed in Boiler Rooms: Comply with ASME Boiler and Pressure Vessel Code.
- 1.5 Approval Submittals: Submit product data, catalog cuts, specifications, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valves with Division-23 section using the valves, not as a separate submittal. For each valve, identify systems where the valve is intended for use.

Gate Valves. Type GA.
Check Valves. Type CK.
Ball Valves. Type BA.
Butterfly Valves. Type BF.

- 1.6 O&M Data Submittals: Submit a copy of approval submittals. Submit installation instructions, maintenance data and spare parts lists for each type of valve. Include this data in the O&M Manual.

2 PRODUCTS

- 2.1 General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with specifications and installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections.
- 2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide valves of one of

the producers listed for each valve type. The model numbers are listed for contractor's convenience only. In the case of a model number discrepancy, the written description shall govern.

2.3 Gate Valves:

2.3.1 Packing: Select valves designed for repacking under pressure when fully opened, equipped with non-asbestos packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

2.3.2 Comply with the following standards:

Cast Iron Valves: MSS SP-70. Cast Iron Gate Valves, Flanged and Threaded Ends.

Bronze Valves: MSS SP-80. Bronze Gate, Globe, Angle and Check Valves.

Steel Valves: ANSI B16.34. Steel Standard Class Valve Ratings.

2.3.3 Types of gate (GA) valves:

- 1 Threaded Ends 2" and Smaller (GA1): Class 125, bronze body, screwed bonnet, rising stem, solid wedge. Stockham B-100. Nibco T-111. Crane 428. Milwaukee 148.
- 2 Soldered Ends 2" and Smaller (GA2): Class 125, bronze body, screwed bonnet, non-rising stem, solid wedge. Stockham B-108 or B-109. Nibco S-111. Crane 1334. Milwaukee 149.
- 3 Flanged Ends 2½" and Larger (GA3): Class 125, iron body, bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge. Stockham G-623. Nibco F617-0. Crane 465½. Milwaukee F2885.
- 4 Threaded Ends 2" and Smaller (GA4): Class 150, bronze body, screwed bonnet, rising stem, solid wedge. Stockham B-122. Nibco T-131. Crane 431. Milwaukee 1150.
- 5 Soldered Ends 2" and Smaller (GA5): Class 150, bronze body, screwed bonnet, rising stem, solid wedge. Stockham B-124. Nibco S-134. Milwaukee 1169.
- 6 Threaded Ends 2" and Smaller (GA6): 175 WWP, bronze body, screwed bonnet, rising stem, OS&Y, solid wedge, UL-listed. Stockham B-133. Nibco T-104-0.
- 7 Flanged Ends 2½" and Larger (GA7): 175 WWP, iron body, bolted bonnet, rising stem, OS&Y, solid wedge, UL listed. Stockham G-634. Nibco F-607-0TS
- 8 Threaded Ends 2" and Smaller (GA8): Class 200, bronze body, union bonnet, rising stem, solid wedge, renewable seat. Stockham B-132. Nibco T-154-SS. Milwaukee 1174.
- 9 Flanged Ends 2½" and Larger (GA9): Class 250, iron body bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge. Stockham F-667. Nibco F-667-0. Crane 7½E. Milwaukee F-2894.
- 10 Threaded Ends 2" and Smaller (GA10): Class 300, bronze body, union bonnet, rising

stem, solid wedge, renewable seat. Stockham B-145. Nibco T-174-SS. Crane 634E. Milwaukee 1184.

- 11 Flanged Ends 2½" and Larger (GA11): Class 300, cast steel body, bolted bonnet, rising stem, solid wedge, seal-welded seat rings. Provide trim to match use. Stockham 30-0F. Crane 33.
- 12 Flanged Ends 2½" and Larger (GA12): 300 WWP, iron body, bolted bonnet, bronze mounted, rising stem, OS&Y, solid wedge, UL-listed. Stockham F-670. Nibco F-697-0.

2.4 Check Valves:

2.4.1 Construction: Construct valves of castings free of any impregnating materials. Construct valves with a bronze regrinding disc with a seating angle of 40° to 45°, unless a composition disc is specified. Provide stop plug as renewable stop for disc hanger, unless otherwise specified. Disc and hanger shall be separate parts with disc free to rotate. Support hanger pins on both ends by removable side plugs.

2.4.2 Comply with the following standards:

Cast Iron Valves: MSS SP-71. Cast Iron Swing Check Valves, Flanged and Threaded Ends.

Bronze Valves: MSS SP-80. Bronze Gate, Globe, Angle and Check Valves.

Steel Valves: ANSI B16.34. Steel Standard Class Valve Ratings.

2.4.3 Types of check (CK) valves:

- 1 Threaded Ends 2" and Smaller (CK1): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-319. Nibco T-413-BY. Crane 1707. Milwaukee 509.
- 2 Soldered Ends 2" and Smaller (CK2): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-309. Nibco S-413-B. Crane 1707S. Milwaukee 1509.
- 3 Flanged Ends 2½" and Larger (CK3): Class 125, iron body, bronze-mounted, bolted cap, horizontal swing, cast-iron or composition disc. Stockham G-931 or G-932 as applicable. Nibco F918-B. Crane 373. Milwaukee F2974 as applicable.
- 4 Threaded Ends 2" and Smaller (CK4): 200 WWP, bronze body, screwed cap, horizontal swing, regrinding type bronze disc, for fire sprinkler use. Nibco KT-403-W.
- 5 Flanged Ends 2½" and Larger (CK5): 175 WWP, iron body, bolted cap, bronze mounted, composition disc, UL listed, with ball drip if required. Stockham G-940. Nibco F-908-W.
- 6 Threaded Ends 2" and Smaller (CK6): Class 200, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-345. Nibco T-453-B. Crane 36. Milwaukee 518/508.
- 7 Flanged Ends 2½" and Larger (CK7): Class 250, iron body, bronze mounted, bolted cap, cast-iron disc. Stockham F-947. Nibco F-968-B. Crane 39E. Milwaukee F2970.
- 8 Threaded Ends 2" and Smaller (CK8): Class 300, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-375. Nibco T-473-B. Crane 76E.

Milwaukee 517/507.

- 9 Flanged Ends 2½" and Larger (CK9): Class 300, cast steel body, bolted cap, horizontal swing, seal welded seat rings, chromium stainless disc. Stockham 30-SF. Crane 159.

2.5 Ball Valves:

- 2.5.1 General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

- 2.5.2 Construction: Ball valves shall be rated for 150 psi saturated steam and 600 psi non-shock cold water. Pressure containing parts shall be constructed of ASTM B-584 alloy 844, or ASTM B-124 alloy 377. Valves shall be furnished with blow-out proof bottom loaded stem constructed of ASTM B-371 alloy 694 or other approved low zinc material. Provide TFE packing, TFE thrust washer, chrome-plated ball and reinforced teflon seats. Valves 1" and smaller shall be full port design. Valves 1¼" and larger shall be conventional port design. Stem extensions shall be furnished for use in insulated piping where insulation exceeds ½" thickness.

- 2.5.3 Comply with the following standards:

MSS SP-72. Ball Valves with Flanged or Butt Welding Ends for General Service.

MSS SP-110. Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

- 2.5.4 Types of ball (BA) valves:

- 1 Threaded Ends 2" and Smaller (BA1): Bronze two-piece full port body with adjustable stem packing, stainless steel ball, trim, and handle. Nibco T-585-66. Stockham T285-BR-R-T. Milwaukee BA100S. Apollo 77-100.
- 2 Soldered Ends 2" and Smaller (BA2): Bronze three-piece full port body with adjustable stem packing. Nibco S-595-Y-66. Milwaukee BA350. Apollo 82-200.
- 3 Threaded Ends 1" and Smaller (BA3): Bronze two-piece full port body, UL listed (UL 842) for use with flammable liquids and LP gas. Nibco T-585-70-UL.
- 4 Threaded Ends 2" and Smaller (BA4): 175 WWP, bronze two-piece body, UL listed for fire protection service. Nibco KT-585-70-UL and KT-580-70-UL.
- 5 Threaded Ends 2" and Smaller (BA5): 400 WWP, bronze two-piece body, for fire protection service. Nibco KT-580.
- 6 Threaded Ends 2½" and Smaller (BA6): 300 WWP, bronze three-piece body, gear operator with handwheel, indicator flag, accepts tamper switch, for fire protection, UL listed. Nibco T-505-4 and G-505-4.
- 7 Flanged Ends 2½" and Larger (BA7): Class 150, carbon steel full bore two-piece body with adjustable stem packing, stainless steel ball, trim, and handle. Nibco F515-S6 series. Apollo 88A-240.

2.6 Butterfly Valves:

2.6.1 General: Comply with MSS SP-67, Butterfly Valves. Provide butterfly valves designed for tight shut-off. Where used for terminal or equipment removal or repair, select lug type valves. Select wafer type valves for other applications. Provide gear operators on all butterfly valves 6" and larger.

2.6.2 Types of butterfly (BF) valves:

- 1 Wafer Type 3" and Larger (BF1): 200 CWP, cast-iron body, lever-operated, cadmium-plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-512. Nibco WD 2110-3. Crane 42-FXB-TL. Milwaukee MW222E-8416.
- 2 Lug Type 3" and Larger (BF2): 200 CWP, cast-iron body, lever-operated, cadmium-plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-712. Nibco LD 2110-3. Crane 44-FXB-TL. Milwaukee ML132B-8416.
- 3 Wafer Type 3" and Larger (BF3): 150/200 CWP, cast-iron body, gear-operated, cadmium-plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-522 and LG-521. Nibco WD 2110-5. Crane 42-FXB-G. Milwaukee MW 122B-8115.
- 4 Lug Type 3" and Larger (BF4): 150/200 CWP, cast-iron body, gear-operated, cadmium-plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-722 and LG-721. Nibco LD 2110-5. Crane 44-FXB-G. Milwaukee ML 132B-8115.
- 5 Wafer Type 4" and Larger (BF5): 175 WWP, cast-iron body, gear-operated, nickel-plated ductile iron disc, Type 410 stainless steel stem, EPT seat, UL listed. Stockham LG-52U. Nibco WD 3510-8.
- 6 Lug Type 4" and Larger (BF6): 175 WWP, cast-iron body, gear-operated, nickel-plated ductile iron or aluminum bronze disc, Type 410 stainless steel stem, EPT seat, UL listed. Stockham LG-72U. Nibco LD 3510-8.
- 7 Grooved Type 4" and Larger (BF7): 175 WWP, cast-iron body, gear-operated, nickel-plated ductile iron or aluminum bronze disc, Type 410 stainless steel stem, EPT seat, UL listed. Stockham LG-82U. Nibco GD 1765-2.

2.7 Valve Features:

2.7.1 General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1

2.7.2 Valve features specified or required shall comply with the following:

- 1 Bypass: Comply with MSS SP-45, and except as otherwise indicated, provide manufacturer's standard bypass piping and valving. Provide for gate valves 8" and larger.
- 2 Drain: Comply with MSS SP-45, and provide threaded pipe plugs complying with applicable Division-22 pipe or tube section. Provide for gate valves 8" and larger.
- 3 Flanged: Provide valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5

(steel), or ANSI B16.24 (bronze).

- 4 Threaded: Provide valve ends complying with ANSI B2.1.
- 5 Solder-Joint: Provide valve ends complying with ANSI B16.18.
- 6 Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry unless otherwise specified.
- 7 Non-Metallic Disc: Provide non-metallic material selected for service indicated in accordance with manufacturer's published literature.
- 8 Renewable Seat: Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.
- 9 Extended Stem: Increase stem length by 2" minimum, to accommodate insulation applied over valve.
- 10 Mechanical Actuator: Provide factory-fabricated gears, gear enclosure, external chain attachment and chain designed to provide mechanical advantage in operating valve for all valves 4" and larger that are mounted more than 7'-0" above the floor, or are otherwise difficult to operate regardless of height.

3 EXECUTION

3.1 Installation:

- 3.1.1 General: Install valves where required for proper operation of piping and equipment, including valves in branch lines to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward below horizontal plane.
- 3.1.2 Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- 3.1.3 Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator.
- 3.1.4 Mechanical Actuators: Install mechanical actuators as recommended by valve manufacturer.
- 3.2 Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:
 - 3.2.1 Tube Size 2" and Smaller: Threaded valves.
 - 3.2.2 Pipe Size 2" and Smaller: Threaded valves.
 - 3.2.3 Pipe Size 2½" and Larger: Flanged valves.

- 3.3 Non-Metallic Disc: Limit selection and installation of valves with non-metallic disc to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
- 3.4 Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
- 3.5 Installation of Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction flow.

END OF SECTION 230523

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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SECTION 23 05 29 - SUPPORTS, ANCHORS, AND SEALS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-23 Basic Materials and Methods section, and is a part of each Division-23 section making reference to or requiring supports, anchors, and seals specified herein.
- 1.3 Extent of supports, anchors, and seals required by this section is indicated on drawings and/or specified in other Division-23 sections.
- 1.4 Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports, anchors, and seals.
- 1.5 MSS Standard Compliance:
 - 1.5.1 Provide pipe hangers and supports of which materials, design, and manufacture comply with ANSI/MSS SP-58.
 - 1.5.2 Select and apply pipe hangers and supports, complying with MSS SP-69.
 - 1.5.3 Fabricate and install pipe hangers and supports, complying with MSS SP-89.
 - 1.5.4 Terminology used in this section is defined in MSS SP-90.
- 1.6 UL Compliance: Provide products which are Underwriters Laboratories listed .

2 PRODUCTS

- 2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide supports and hangers by Grinnel, Michigan Hanger Company, B-Line Systems, or approved equal.
- 2.2 Horizontal-Piping Hangers and Supports: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
 - 2.2.1 Adjustable Steel Clevises: MSS Type 1.

- 2.2.2 Steel Double Bolt Pipe Clamps: MSS Type 3.
- 2.2.3 Adjustable Steel Band Hangers: MSS Type 7.
- 2.2.4 Steel Pipe Clamps: MSS Type 4.
- 2.2.5 Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.
- 2.2.6 Single Pipe Rolls: MSS Type 41.
- 2.2.7 Adjustable Roller Hanger: MSS Type 43.
- 2.2.8 Pipe Roll Stands: MSS Type 44 or Type 47.
- 2.3 Vertical-Piping Clamps: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
 - 2.3.1 Two-Bolt Riser Clamps: MSS Type 8.
 - 2.3.2 Four-Bolt Riser Clamps: MSS Type 42.
- 2.4 Hanger-Rod Attachments: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
 - 2.4.1 Steel Turnbuckles: MSS Type 13.
 - 2.4.2 Malleable Iron Sockets: MSS Type 16.
- 2.5 Building Attachments: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.
 - 2.5.1 Center Beam Clamps: MSS Type 21.
 - 2.5.2 C-Clamps: MSS Type 23.
 - 2.5.3 Malleable Beam Clamps: MSS Type 30.
 - 2.5.4 Side Beam Brackets: MSS Type 34.
 - 2.5.5 Concrete Inserts: MSS Type 18.

- 2.6 Saddles and Shields: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- 2.6.1 Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- 2.6.2 Protection Saddles: MSS Type 39; use with rollers, fill interior voids with segments of insulation matching adjoining insulation.
- 2.7 Miscellaneous Materials:
- 2.7.1 Metal Framing: Provide products complying with NEMA STD ML 1.
- 2.7.2 Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.
- 2.7.3 Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
- 2.7.4 Heavy-Duty Steel Trapezes: Fabricate from steel shapes or continuous channel struts selected for loads required; weld steel in accordance with AWS standards.

3 EXECUTION

3.1 Preparation

- 3.1.1 Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.
- 3.1.2 Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, and installers of other work requiring coordination with work of this section for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.2 Installation of Building Attachments:

- 3.2.1 Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.
- 3.2.2 In areas of work requiring attachments to existing concrete, use self drilling rod inserts, Phillips Drill Co., "Red-Head" or equal.

3.3 Installation of Hangers and Supports:

3.3.1 General: 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 spacings 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.

3.3.1.1 Horizontal steel pipe and copper tube 1-1/4" diameter and smaller: support on 6 foot centers.

3.3.1.2 Horizontal steel pipe and copper tube 1-1/2" diameter and larger: support on 10 foot centers.

3.3.1.3 Vertical steel pipe and copper tube: support at each floor.

3.3.1.4 Plastic pipe: support in accordance with manufacturer's recommendations and the Florida Building Code, Plumbing.

3.3.1.5 Fire protection piping: support in accordance with NFPA 13.

3.3.2 Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

3.3.3 Paint all black steel hangers with black enamel. Galvanized steel and copper clad hangers do not require paint.

3.3.4 Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

3.3.5 Provision for Movement:

3.3.5.1 Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

3.3.5.2 Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

3.3.5.3 Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

3.3.6 Insulated Piping: Comply with the following installation requirements.

3.3.6.1 Shields: Where low-compressive-strength insulation or vapor barriers are indicated, install coated protective shields.

3.3.6.2 Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

- 3.3.7 Support fire protection piping independently of other piping.
- 3.4 Installation of Anchors:
- 3.4.1 Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
- 3.4.2 Fabricate and install anchors by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- 3.4.3 Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and elbows. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.
- 3.4.4 Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.
- 3.5 Equipment Bases:
- 3.5.1 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.
- 3.5.2 Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands. Prime and paint with black enamel.

END OF SECTION 230529

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 05 48 - VIBRATION ISOLATION

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-23 Basic Mechanical Materials and Methods section, and is part of each Division-23 section making reference to vibration isolation equipment.
- 1.3 Extent of vibration isolation required by this section is indicated on drawings and/or specified in other Division-23 sections.
- 1.4 Approval Submittals: When required by other Division-23 sections, submit product data sheets for each type of vibration isolation equipment including configuration and rating data. Submit with Division-23 section using vibration isolation, not as a separate submittal. Provide calculations showing supported weight, deflection, and isolator size and type for each item of supported equipment. Submit for:
- Equipment Mountings. Type EM.
Hangers. Type HA.
Bases and Frames. Type BF.
Pipe Flexible Connections. Type PF.
- 1.5 O&M Data Submittals: Submit a copy of approval submittals for each type of vibration isolation equipment. Include this data in O&M Manual.

2 PRODUCTS

- 2.1 General: Provide factory-fabricated products recommended by manufacturer for use in service indicated. Provide products of types and deflections indicated; provide proper selection as determined by Installer to comply with specifications and installation requirements. Provide sizes which properly fit with equipment. All metal parts installed outside shall be hot dipped galvanized after fabrication.
- 2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide vibration isolation equipment of: Mason Industries, Keflex, Consolidated Kinetics, Vibration Mountings & Controls, Wheatley or approved equal. All vibration isolators shall be supplied by a single approved manufacturer.
- 2.3 Equipment Mountings:
- 2.3.1 Select mountings with the required deflection and fastening means. Provide steel rails or bases as required to compensate for equipment rigidity and overhang.
- 2.3.2 Types of equipment mountings (EM):

- 1 Spring Mountings (EM1): Spring isolators shall be free-standing and laterally stable without any housing. All mounts shall have leveling bolts. Spring diameter shall be not less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Springs shall be so designed that the ratio of horizontal stiffness to vertical stiffness is approximately one. Provide a nominal static deflection of at least 1.0". Basis of Design: Mason Industries SLFH.
- 2 Spring Mountings with Housings (EM2): Spring isolators shall consist of open, stable steel springs and include vertical travel limit stops to control extension when weight is removed. The housing of the spring unit shall serve as blocking during erection of equipment. Provide a nominal static deflection of at least 1.0". All mountings used outside shall be hot dipped galvanized. Basis of Design: Mason Industries SLR.
- 3 Spring Mountings with Housings (EM3): Spring isolators shall consist of open, stable steel springs with neoprene inserts to limit movement between upper and lower housing on start and stop. Provide a nominal static deflection of at least 1.0". Mountings shall be specifically designed for critical areas on light-weight floors. Basis of Design: Mason Industries C.
- 4 Neoprene Mountings (EM4): Double deflection neoprene-in-shear mountings shall have a minimum static deflection of 0.35". All metal surfaces shall be neoprene covered. The top and bottom surfaces shall be neoprene ribbed and bolt holes shall be provided in the base. Basis of design: Mason Industries ND.
- 5 Pads (EM5): Waffle or ribbed pattern neoprene pads shall be fabricated from 40-50 durometer neoprene. Provide rigid steel plate and mounting angles as required. Basis of design: Mason Industries Super W.

2.4 Hangers:

2.4.1 Select hangers with the required deflection. Provide all required hanger rods and fasteners.

2.4.2 Types of hangers (HA):

- 1 Hangers (HA1): Vibration hangers shall contain a steel spring set in a neoprene cup manufactured with a grommet to prevent short-circuiting of the hanger rod. The cup shall contain a steel washer designed to properly distribute the load on the neoprene and prevent its extrusion. Spring diameters and hanger box lower-hole sizes shall be large enough to permit the hanger rod to swing through a 30-degree arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Basis of Design: Mason Industries 30.
- 2 Hangers (HA2): Vibration hangers shall contain a laterally stable steel spring and 0.3" deflection neoprene or fiberglass element in series. A neoprene neck shall be provided where the hanger rod passes through the steel box supporting the isolator mount to prevent metal to metal contact. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Basis of Design: Mason

Industries 30N.

- 3 Hangers (HA3): Double deflection neoprene-in-sheer or EPDM hangers. Units shall be complete with projected neoprene bushing to prevent steel-to-steel contact between hanger box and hanger rod. Average static deflection shall be not less than 0.4 inches. Basis of Design: Mason Industries HD.

2.5 Bases and Frames (BF):

- 2.5.1 Select mounting bases and frames as required for equipment dimensions, service access and fastening means. Provide all fasteners. Coordinate and provide required vibration isolators to match mounting bases and frames.

2.5.2 Types of bases and frames (BF):

- 1 Steel Base Frame for Floor-Mounted Equipment (BF1): Provide frames consisting of structural steel sections sized, spaced and connected to form a rigid base which will not twist, rack, deform or deflect in any manner that will negatively affect the operation of the supported equipment or the performance of the vibration-isolation mounts. Frames shall be of adequate size and plan form to support basic equipment units and motors plus any associated pipe elbow or duct elbow supports and electrical control elements or other components closely related and requiring resilient support in order to prevent vibration transfer from equipment to the building structure. Frames shall include side mounting brackets for attachment to vibration isolation floor mounts. The clearance between the underside of any frame or mounted equipment unit and the top of the building structure below shall be at least 2 inches. Basis of Design: Mason Industries WFSL.
- 2 Concrete Inertia Block for Floor-Mounted Equipment (BF2): Provide concrete inertia blocks formed of stone-aggregate concrete (150 lbs./cu.ft.) cast between appropriate steel reinforcing perimeter structural steel channels. Inertia block thickness shall be not less than 1/12 the longest dimension of the mounted equipment or equipment assembly. Inertia blocks shall be built to form a rigid base which will not twist, rack, deform, deflect or crack in any manner that will negatively affect the operation of the supported equipment or the performance of the vibration-isolation mounts. Inertia blocks shall be of adequate size and plan form to support basic equipment units and motors plus any associated pipe or duct elbow supports, electrical control elements or other components closely related and requiring resilient support in order to prevent vibration transfer from equipment to the building structure. Inertia blocks shall include side mounting bracket pockets for spring mounting. The clearance between the underside of any inertia block and the top of the building structure below shall be at least 2 inches. The vibration isolator supplier may furnish the structural steel perimeter frame, including reinforcing and anchor bolts. Basis of Design: Mason Industries KSL/BMK.
- 3 Steel Rails (BF3): Provide steel rails of channels or angles with vibration isolators as required. Basis of Design: Mason Industries, RND or RC.
- 4 Vibration Isolation Base for Rooftop Equipment (BF4): Provide aluminum vibration isolation bases that fit over roof curb and under the equipment. Provide spring isolators having a 1" minimum static deflection, resilient snubbers for wind resistance, closed cell weather seal at top and bottom, and EDPM flexible connection around entire perimeter. The unit shall provide a water-tight system. Basis of Design: Mason Industries CMAB.

- 5 Vibration Isolation Curb for Rooftop Equipment (BF5): Provide steel spring isolation curb with cadmium or zinc electroplated steel springs on ¼" thick neoprene pads to support the upper frame. The upper frame must provide continuous support for the equipment and must be held captive by ¼" thick neoprene snubber bushings. Minimum spring deflection is 1½" . Provide galvanized steel counter-flashing and EPDM bellows for the corners. Provide access covers for all springs. The entire assembly shall be waterproof. Curbs shall be a minimum of 12" high and shall include 2" thick insulation. Provide curbs designed to accommodate for roof pitch so that equipment is set level.

Provide perimeter angle and cross members with two layers of 5/8" waterproof sheetrock at the floating member of the curb. Stagger sheetrock joints. Sheetrock must completely surround all ducts and shall be caulked. Where the mechanical arrangement prevents attaching to the floating member, the barrier shall be attached as high as possible on the fixed curb with 1" thick closed cell neoprene flexible seals around the ducts. A 4" layer of 1.5 pcf fiberglass shall cover the entire solid roof surface under the unit. Basis of Design: Mason Industries RSC-dB.

2.6 Pipe Flexible Connections:

- 2.6.1 Select pipe flexible connections suitable for duty indicated with ends to match piping system.

2.6. Types of pipe flexible connections (PF):

- 1 Pump Connections (PF1): Provide EPDM and dacron or neoprene and nylon flexible connectors rated at 200 psi and 250°F. Connectors shall have the number of spheres required and ductile iron floating flanges with baked enamel finish. Provide control rods or cables as required for each application. Basis of Design: Mason Industries SFDEJ with reinforcing rings.
- 2 Chiller Connections (PF2): Provide EPDM and dacron or neoprene and nylon flexible connectors rated at 200 psi and 250°F. Connectors shall have the number of spheres required and ductile iron floating flanges with baked enamel finish. Provide control rods or cables as required for each application. Basis of Design: Mason Industries SFEJ.
- 3 Coil Connections (PF3): Provide EPDM and dacron or neoprene and nylon flexible connectors rated at 200 psi at 250°F. Connectors shall have the number of spheres required and ductile iron floating flanged or threaded ends with baked enamel finish. Provide control rods or cables as required for each application. Basis of Design: Mason Industries SFU or SFEJ as required.
- 4 Stainless Steel Flexible Hoses (PF4): Provide 300 psi working pressure flexible hoses with corrugated seamless hose body and braided cover. Basis of Design: Mason Industries BSS threaded or RF flanged, as required.
- 5 Bronze Flexible Hoses (PF5): Provide 300 psi working pressure flexible hoses with corrugated bronze hose body and braided cover. Basis of Design: Mason Industries BBF with sweat ends.

3 EXECUTION

- 3.1 Install vibration isolation devices for the duty indicated and for ease of inspection, adjustment, and proper operation. Install in accordance with the manufacturer's written instructions and coordinate with shop drawings of supported equipment.
- 3.2 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.
- 3.3 Piping, ductwork and conduit shall not be suspended from one another or physically contact one another. Vibrating systems shall be kept free from non-vibrating systems.
- 3.4 Equipment Mountings:
- 3.4.1 Unless otherwise shown or specified, all floor-mounted equipment shall be set on housekeeping equipment bases. Refer to Division-23 section "Supports, Anchors, and Seals".
- 3.4.2 No equipment unit shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators, and such direct support is approved by the equipment manufacturer. All support frames shall be sufficiently stiff and rigid so as to prevent distortion and misalignment of components installed thereon.
- 3.4.3 Align equipment mountings for a free, plumb installation. Isolators that are binding, offset or fully compressed will not be accepted.
- 3.5 Hangers:
- 3.5.1 Position vibration isolation hangers so that hanger housing may rotate a full 360 degrees without contacting any object.
- 3.5.2 Install steel angles, channels, rods and fasteners to level equipment, piping or ductwork and to evenly distribute the supported weight.
- 3.6 Bases and Frames:
- 3.6.1 Unless otherwise indicated, all equipment mounted on vibration-isolated bases shall have a minimum operating clearance of 2 inches between the structural steel frame and the concrete housekeeping pad or floor beneath the equipment. The clearance space shall be checked to ensure that no construction debris has been left to short-circuit or restrict the proper operation of the vibration isolation system.
- 3.7 Pipe Flexible Connections:
- 3.7.1 Piping connected to vibration isolated equipment shall be installed so that it does not strain or force out of alignment the vibration isolators supporting the basic equipment, nor shall pipes restrict such equipment from "floating" freely on its respective vibration isolation system. Flexible connections shall be used to eliminate transferring vibration along piping.
- 3.7.2 Flexible connections and hoses shall not be used to compensate for pipe misalignment. Units shall be aligned so that the flexible connection is not distorted perpendicular to the axis of the piping.

- 3.7.3 Install flexible connections in pump suction and discharge, chiller inlet and outlet, water coil inlet and outlet and where shown on the drawings or required by equipment specifications.
- 3.7.4 Drain piping connected to vibrating equipment shall not physically contact any building construction or non-isolated systems or components.
- 3.8 Connections of Ducts: Ducts shall be connected to fan intakes and discharges by means of flexible connectors in accordance with Division-23 section "Ductwork Accessories" so that all vibrating equipment is fully isolated.

END OF SECTION 230548

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 05 53 - MECHANICAL IDENTIFICATION

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-23 Basic Mechanical Materials and Methods section, and is part of each Division-23 section making reference to or requiring identification devices specified herein.
- 1.3 Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division-23 sections.
- 1.4 Refer to Division-26 sections for identification requirements of electrical work; not work of this section. Refer to other Division-23 sections for identification requirements for controls; not work of this section.
- 1.5 Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

2 PRODUCTS

- 2.1 General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-23 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.
- 2.2 Painted Identification Materials
 - 2.2.1 Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1-¹/₄" high letters for ductwork and not less than ³/₄" high letters for access door signs and similar operational instructions.
 - 2.2.2 Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.
 - 2.2.3 Identification Paint: Standard identification enamel.
- 2.3 Plastic Pipe Markers
 - 2.3.1 Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers.

- 2.3.1.1 Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with name as shown or specified.
- 2.3.1.2 Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.
- 2.4 Valve Tags:
- 2.4.1 Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in ¼" high letters and sequenced valve numbers ½" high, and with 5/32" hole for fastener. Provide 1-½" diameter tags, except as otherwise indicated.
- 2.4.2 Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32" thick engraved plastic laminate valve tags, with piping system abbreviation in ¼" high letters and sequenced valve numbers ½" high, and with 5/32" hole for fastener. Provide 1-½" square black tags with white lettering, except as otherwise indicated.
- 2.5 Engraved Plastic-Laminate Signs:
- 2.5.1 General: Provide engraving stock melamine plastic laminate, in the sizes and thicknesses indicated, engraved with engraver's standard letter style a minimum of 3/4" tall and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
- 2.5.2 Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.
- 2.5.3 Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
- 2.6 Stamped Nameplates: Provide equipment manufacturer's standard stamped nameplates for motors, AHUs, pumps, etc.

3 EXECUTION

- 3.1 Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- 3.2 Ductwork Identification:
- 3.2.1 General: Identify air supply, return, exhaust, intake and relief ductwork with stenciled signs and arrows, showing ductwork service and direction of flow, in black or white. Example: **AHU-1 Supply →**
- 3.2.2 Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures, and at 50' spacings along exposed runs.

- 3.2.3 Access Doors: Provide stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate and procedural information.
- 3.3 Piping System Identification:
- 3.3.1 General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:
- 3.3.1.1 Plastic pipe markers.
- 3.3.1.2 Stenciled markers, black or white for best contrast.
- 3.3.2 Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces and exterior non-concealed locations.
- 3.3.2.1 Near each valve and control device.
- 3.3.2.2 Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
- 3.3.2.3 Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
- 3.3.2.4 At access doors, manholes and similar access points which permit view of concealed piping.
- 3.3.2.5 Near major equipment items and other points of origination and termination.
- 3.3.2.6 Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
- 3.3.2.7 On piping above removable acoustical ceilings, except omit intermediately spaced markers.
- 3.3.3 The following piping shall be color-coded where exposed in mechanical and electrical rooms by completely painting the piping with the indicated color. Use standard colors where exposed in finished spaces. Use standard identification methods in concealed areas.
- Fire protection piping - Red
Gas piping – Yellow
Condenser Water Piping - Green
- 3.4 Valve Identification: Provide coded valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. Coordinate code with operating instructions.
- 3.5 Valve Charts: Provide framed, glass covered valve charts in each mechanical room. Identify coded valve number, valve function, and valve location for each valve. Provide floor plan with approximate location of each valve identified.

- 3.6 Mechanical Equipment Identification: Install engraved plastic laminate sign on a vertical surface on or near each major item of mechanical equipment and each operational device. Label shall indicate type of system and area served. Provide signs for the following general categories of equipment and operational devices:
- 3.6.1 Main control and operating valves, including safety devices.
 - 3.6.2 Meters, gauges, thermometers and similar units.
 - 3.6.3 Fuel-burning units including boilers, furnaces, and heaters.
 - 3.6.4 Pumps, compressors, chillers, condensers, and similar equipment.
 - 3.6.5 Heat exchangers, coils, evaporators, cooling towers, heat recovery units and similar equipment.
 - 3.6.6 Fans, blowers, primary balancing dampers and VAV boxes.
 - 3.6.7 HVAC air handlers and fan coil units.
 - 3.6.8 Air conditioning indoor and outdoor units.
- 3.7 Stamped Nameplates: Equipment manufacturers to provide standard stamped nameplates on all major equipment items such as motors, pumps, AHUs, etc. Where motors are hidden from view (within equipment casing, or otherwise not easily accessible, etc.), the equipment supplier shall furnish a duplicate motor data nameplate to be affixed to the equipment casing in an easily visible location, unless data is already included on the equipment nameplate.]
- 3.8 Adjusting and Cleaning:
- 3.8.1 Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
 - 3.8.2 Cleaning: Clean face of identification devices, and glass frames of valve charts.

END OF SECTION 230553

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 05 56 - ACCESS DOORS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-23 Basic Mechanical Materials and Methods section, and is part of each Division-23 section making reference to or requiring access panels specified herein.
- 1.3 Approval Submittals:
- 1.3.1 Product Data: When required by other Division-23 sections, submit product data for access doors. Submit with Division-23 section using access doors, not as a separate submittal. Include rating data.
- 1.4 O&M Data Submittals: Submit a copy of approval submittal. Include this data in O&M Manuals.

2 PRODUCTS

- 2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide access doors by Milcor, Jay R. Smith, Zurn, BOICO, Elmdor, or approved equal.
- 2.2 General: Where floors, walls and ceilings must be penetrated for access to plumbing work, provide types of access doors indicated. Furnish sizes indicated or, where not otherwise indicated, furnish adequate size for intended and necessary access. Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.
- 2.3 Access Door Construction: Except as otherwise indicated, fabricate wall/ceiling door units of welded stainless steel construction with welds ground smooth and brushed finish; 16-gauge frames and 14-gauge flush panel doors; 175° swing with concealed spring hinges; flush screw-driver-operated cam locks.

3 EXECUTION

- 3.1 Access doors shall be installed to operate and service all plumbing equipment including valves, dampers, duct access panels, and other items requiring maintenance that are concealed above or behind finished construction. Access doors shall be installed in walls, chase and floors as necessary, but are not required in accessible suspended ceiling systems.
- 3.2 Access doors shall be installed by the Division installing the substrate construction. However, responsibility for furnishing and determining location of access doors is part of this Division's work. The style of access door shall be suitable for construction into which installed.

- 3.3 Access doors shall be sized and located as required to provide proper maintenance and service access in accordance with the manufacturer's recommendations and code authority requirements for all devices and equipment.

END OF SECTION 230556

- 3.5.1 Verify that air grilles (supply, return, exhaust, transfer, outdoor, etc.) are installed and connected to the duct system.
- 3.5.2 Verify that duct systems are clean of debris.
- 3.5.3 Verify that ducts attached with flexible connectors are aligned within ½" and have a uniform gap between ducts of 1"-1.5". Flexible connectors shall not leak and shall be insulated.
- 3.5.4 Verify that filters are clean and filter spacers are installed.
- 3.5.5 Verify that balancing dampers at grilles and branch ducts are operational and are fully opened.
- 3.5.6 Verify that fire and smoke dampers are correctly installed and are fully opened.
- 3.5.7 Verify that fan discharges are appropriate for the outlet ductwork with regards to the "system effect" per AMCA Publication 201. Inappropriate fan discharges will not be accepted.
- 3.5.8 Verify proper fan rotation.
- 3.5.9 Verify proper belt drive alignment.
- 3.5.10 Verify fan motor overload elements are correctly sized.
- 3.5.11 Adjust fan sheave until CFM is at or above design CFM. Provide additional sheaves and belts as required. Verify that motor is not overloaded.
- 3.5.12 Verify that HVAC control systems are fully operational.
- 3.6 Hydronic Systems: The Contractor shall provide the following information to the Engineer to substantiate proper start-up and preliminary adjustments of HVAC pumps and piping systems.
 - 3.6.1 Verify that the hydronic systems are properly flushed, filled, vented, purged and chemically treated and that all leaks are repaired. Verify proper air venting.
 - 3.6.2 Verify that the correct strainer screens are clean and installed.
 - 3.6.3 Verify that pump/motor shafts are correctly aligned.
 - 3.6.4 Verify proper pump rotation and flow direction.
 - 3.6.5 Verify that all balancing valves and circuit setters are fully opened.
 - 3.6.6 Verify that test ports, pressure gauges and thermometers are properly installed and are accessible at coils, boilers, pumps, and chillers. Extensions to allow for pipe insulation are required. Pressure gauges at pumps must utilize pump taps in order for head measurements to correlate with the pump performance curves.
 - 3.6.7 Verify pump motor overload elements are correctly sized.

- 3.6.8 Adjust balancing valve at pump discharge until GPM is at or greater than design GPM. Verify motor is not overloaded.
- 3.6.9 Provide flow meter data (IN WC and GPM), pump performance chart with flow data plotted, actual motor volts/amps, rated motor volts/amps and motor overload element capacity.
- 3.6.10 Verify that HVAC control systems for coils, boilers, and chillers are fully operational.
- 3.7 VAV Systems: The Contractor shall provide the following information to the Engineer to substantiate the proper start-up and preliminary adjustments of variable air volume boxes and control systems.
- 3.7.1 Verify that the inlet duct to the box is straight for a minimum of five (5) inlet duct diameters.
- 3.7.2 Verify that the discharge duct from the box has no branch takeoffs within five (5) feet of the box discharge.
- 3.7.3 Set the box thermostat to 85°F. Verify that the box modulates to minimum cooling, and the heating activates.
- 3.7.4 Set the box thermostat to 55°F. Verify that the reverse operation occurs and the box modulates to maximum cooling.
- 3.7.5 Set box thermostat to 75°F. Deadband shall not exceed 2°F.
- 3.7.6 Set minimum and maximum CFM based on manufacturer's calibration curves.
- 3.7.7 Verify that the static pressure probe is located 75% of the distance down the longest duct run. Mark the location of the probe on the as-builts and notify the TAB Contractor of same.
- 3.7.8 Verify that the static pressure control properly modulates the AHU fan's variable frequency drive. Set static pressure controller to maintain 1 in. w.g. as the initial setting.
- 3.7.9 Verify that the supply air temperature controller properly modulates the chilled water control valve. Set controller to maintain 55°F. Verify that all heating coil control valves are properly modulated.
- 3.8 Startup Report: The Contractor shall submit the startup information required by this section to the Engineer in a typed report organized as outlined herein. The Startup Report is required to meet the written notice described herein prior to starting TAB work. TAB work will not start until the Startup Report has been submitted and approved.

END OF SECTION 230590

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 05 91 - TESTING, CLEANING, AND STERILIZATION OF PIPING SYSTEMS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-23 Basic Mechanical Materials and Methods section, and is part of each Division-23 section making reference to or requiring the testing and other procedures specified herein.
- 1.3 Notify the Architect/Engineer when system tests are ready to be witnessed at least 24 hours prior to the test.
- 1.4 All materials, test equipment, and devices required for cleaning, testing, sterilizing or purging shall be provided by the Contractor.

2 PRESSURE TESTS

- 2.1 General: Provide temporary equipment for testing, including pump and gauges. Test piping systems before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with indicated medium and pressurize for indicated pressure and time.
- 2.2 Required test period is four hours.
- 2.3 No piping, fixtures, or equipment shall be concealed or covered until they have been tested. The contractor shall apply each test and ensure that it is satisfactory for the period specified before calling the Architect/Engineer to observe the test. Test shall be repeated upon request to the satisfaction of those making the inspection.
- 2.4 Observe each test section for leakage at the end of the test period. Test fails if leakage is observed or if pressure drop exceeds 5% of the test pressure.
- 2.5 Check of systems during application of test pressures should include visual check for water leakage and soap bubble or similar check for air and nitrogen leakage.
- 2.6 During heating and cooling cycles, linear expansion shall be checked at all elbows and expansion joints for proper clearance.
- 2.7 Repair piping systems sections which fail required piping test. Disassemble and re-install using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- 2.8 Pressure Test Requirements:

- 2.8.1 Soil, Waste, and Vent Test all piping within the building with a 10 foot head of water. Test piping in sections so that all joints are tested. Provide test tees as required.
- 2.8.2 Domestic Water: Perform hydrostatic test on all piping within the building at twice the normal static pressure at service point, but not less than 100 psig. Once tested, flush out piping and leave under pressure of the supply main or 40 psig for the balance of the construction period.
- 2.8.3 Chilled Water: Perform hydrostatic test at 150% of the normal operating pressure, but not less than 100 psig.
- 2.8.4 Fire Sprinkler System: Perform hydrostatic test at 200 psig.

3 CLEANING AND STERILIZATION

- 3.1 General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water or blowdown with air before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
- 3.2 Flush and drain all water systems at least three times. Reverse flush systems from smallest piping to largest piping. Replace startup strainers with operating strainers.
- 3.3 Blowdown all gas systems with air or nitrogen (at a rate of flow exceeding design) at least three times or until no residue shows at each outlet. Reverse blowdown systems from smallest piping to largest piping.
- 3.4 Sterilization of Domestic Water Systems:
 - 3.4.1 Prerequisites: All new hot and cold water piping installed (complete), all fixtures connected, system flushed out, and system filled with water.
 - 3.4.2 The shut off valve at the water main shall be closed, all fixture outlets opened slightly, and a sterilizing solution shall be introduced at a manifold connection installed by the Contractor at the meter.
 - 3.4.3 The solution shall contain 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or calcium hypochlorite. The solution shall be allowed to stand in the system for at least eight hours after which the entire system shall be flushed.
 - 3.4.4 After final flushing, all aerators shall be removed, cleaned, and reinstalled. After final flush the residual chlorine shall not exceed 0.2 parts per million.
 - 3.4.5 The Architect/Engineer shall be notified 24 hours prior to the procedure so that it can be witnessed.
 - 3.4.6 Provide sampling and certified report by an independent testing lab. Provide written Health Department approval of disinfection samples.
- 3.5 Chilled Water Pipe Cleaning: After completion of all work and operational check out of the HVAC installations and prior to acceptance of the project by the Owner, the following shall be

accomplished. The completed piping systems shall be thoroughly flushed (reversed flushing) as needed to remove all dirt, debris, and any foreign matter that may have been trapped in the piping systems during construction. After flushing of systems is complete, the Contractor shall clean all main strainers and all strainers at air handlers. A second cleaning of all strainers will be required if requested by the Engineer. Contractor shall furnish and install all valves and piping stub outs in the piping systems as needed to accommodate this flushing operation. Install the valves and stub outs at a location and in a manner that will allow them to remain in place for future flushing operations. The flushing and strainer cleaning operations shall be witnessed and approved by the Engineer and Owner's representative. After cleaning of all new systems, the chemical treatment of the existing condenser water system shall be brought back into compliance with the requirements of the owner's chemical treatment vendor. Provide a report of conditions before the new system is connected and after the cleaning/flushing is completed.

END OF SECTION 230591

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 05 93 - TESTING AND BALANCING OF MECHANICAL SYSTEMS

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section. Division-23 Basic Mechanical Materials Sections apply to work of this section.

1.2 The work of this section is intended to be performed by a test and balance contractor under a separate, stand-alone contract.

1.3 Description of Work:

1.3.1 Extent of testing, adjusting, and balancing work (TAB) is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, air distribution systems, hydronic distribution systems and associated equipment and apparatus of mechanical work. The work consists of setting speed and volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required.

1.3.2 Pretesting: Where required by the drawings or other Division 23 sections, pretest existing HVAC systems as directed and report findings prior to start of demolition work or any other modifications to the existing systems. Results of pretesting shall be reported to the Engineer in a timely manner. Comply with standards for final TAB reports described herein.

1.3.3 Coordination: Coordinate with the General Contractor and Mechanical Contractor responsible for the HVAC system installation as required to complete the TAB work.

1.4 The intent of this specification is to balance HVAC systems within the tolerances listed, maintaining the pressure relationships indicated, with a minimum of noise.

1.4.1 Airflow Tolerances:

1.4.1.1 Air Handling: The supply air, return air and outdoor air quantities shall be balanced within $\pm 5\%$ of design values.

1.4.1.2 Exhaust Fans: The exhaust fan quantities shall be set as required to maintain the design exhaust terminal flows within $\pm 5\%$ of design values. If no exhaust terminals exist, exhaust fan air quantities shall be balanced within $\pm 10\%$ of design values.

1.4.1.3 Terminal Units: The air quantities associated with VAV boxes, fan coil units, self-regulating air valves, unit heaters and other similar devices shall be balanced within $\pm 5\%$ of design values.

1.4.1.4 Ceiling Diffusers, Supply Registers, Return and Exhaust Inlets: Balance to an air quantity within $\pm 10\%$ of the design values.

- 1.4.2 Temperature Tolerances:
 - 1.4.2.1 Air Handling Temperatures: The controlled temperatures at AHUs shall be verified to be under control within $\pm 1^{\circ}\text{F}$ of design values.
 - 1.4.2.2 Hot Water Temperatures: The heating hot water controlled temperatures from boilers and heat exchangers and other similar devices shall be under control within $\pm 5^{\circ}\text{F}$.
 - 1.4.2.3 Chilled Water Temperatures: The chilled water controlled temperature from chillers shall be under control within $\pm 1^{\circ}\text{F}$.
 - 1.4.2.4 Process Cooling Water Temperatures: The process cooling water controlled temperature shall be under control within $\pm 5^{\circ}\text{F}$.
 - 1.4.2.5 Room Temperatures: Balance systems and controls within $\pm 2^{\circ}\text{F}$ of indicated settings.
- 1.4.3 Pressure Relationships: Where code or design indicates a specific pressure relationship, the pressure relationship shall take precedence over airflow tolerances. Airflow tolerances may need to be held tighter than allowed tolerances to meet pressure relationships. Demonstrate the existence of positive or negative pressure to Engineer and authority having jurisdiction by making direct measurements of room relative pressure and/or flow direction.
- 1.4.4 Laboratory Systems: In addition to demonstrating proper airflow and temperature control, verify that all setback VAV systems operate correctly and maintain pressure relationships at reduced air flows.
- 1.4.5 Fume Hoods: Balance fume hood systems as required to maintain +10%-0% of the specified face velocity at the indicated sash position. Coordinate with authority having jurisdiction (EH&S) to insure proper fume hood certification.
- 1.4.6 Hydronic Flow: Balance hydronic flow rates to within $\pm 10\%$ of design values.
- 1.5 Quality Assurance: The TAB Contractor shall be certified as follows:
 - 1.5.1 Tester: A firm certified by National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project, who is not the Installer of the systems to be tested and is otherwise independent of the project. Comply with NEBB's "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems" as applicable to this work.
 - 1.5.2 Tester: A firm certified by Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project. AABC-certified firms are independent by definition. Comply with AABC's Manual MN-1 "AABC National Standards", as applicable to this work.
 - 1.5.3 Industry Standards: Comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.
- 1.6 Job Conditions:

- 1.6.1 Do not proceed with testing, adjusting, and balancing work until HVAC work (including Controls) has been completed and is operable. Ensure that there is no residual work still to be completed.
- 1.6.2 Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt and discarded building materials.
- 1.6.3 Do not proceed until architectural work that would affect balancing (walls, ceiling, windows, doors) have been installed.
- 1.6.4 Testing may proceed system by system, but each HVAC system must be complete as describe herein.
- 1.6.5 The mechanical contractor shall make any changes in pulleys, belts, and dampers, and/or add dampers as required for correct balancing.
- 1.7 Approval Submittals
- 1.7.1 Submit the name of the proposed test and balance company for the Engineer's approval within thirty (30) days after awarding of contract.
- 1.8 Test Reports and Verification Submittals:
- 1.8.1 Submit four (4) copies of the dated test and balance report upon completion of TAB work. The report shall include a list of instruments used for the work. The report shall be signed by the supervisor who performed the TAB work. The report shall be certified by a professional engineer (registered in Florida) who is a regular employee of the TAB company.
- 2 PRODUCTS
- 2.1 Patching Materials: Except as otherwise indicated, use same products as used by original Installer for patching holes in insulation, ductwork and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.
- 2.2 Test Instruments: Utilize test instruments and equipment of the type, precision, and capacity as recommended in the referenced standard. All instruments shall be in good condition and shall have been calibrated within the previous six (6) months (or more recently if required by standard).
- 3 EXECUTION
- 3.1 General:
- 3.1.1 Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Do not proceed with TAB work until unsatisfactory conditions have been corrected in manner acceptable to Tester.
- 3.1.2 Test, adjust and balance environmental systems and components, as indicated, in accordance with procedures outlined in applicable standards, and as modified or detailed herein.

- 3.1.3 Test, adjust and balance systems during summer season for air conditioning systems and during winter season for heating systems, including at least a period of operation at outside conditions within 5°F wet bulb temperature of maximum summer design condition, and within 10°F dry bulb temperature of minimum winter design condition. When seasonal operation does not permit measuring final temperatures, then take final temperature readings when seasonal operation does permit. The Contractor shall return for a change of seasons test at no additional cost to the Owner and submit the revised TAB report.
- 3.1.4 Punch List: Prepare a deficiency (punch)list for the Contractor with a copy of the Engineer that lists all items that are incorrectly installed or are functioning improperly. Provide a retest after all items are corrected.
- 3.1.5 Prepare TAB report of test results, including instrumentation calibration reports, in format recommended by applicable standards, modified as required to include all data listed herein.
- 3.1.6 Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes, in manner recommended by original Installer.
- 3.1.7 Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.
- 3.1.8 Include in the TAB report recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.
- 3.1.9 Include an extended warranty of ninety (90) days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck, or resetting of any component as listed in test report. The TAB company shall provide technicians and instruments and make any tests required by the Engineer during this time period.
- 3.2 Controls
- 3.2.1 Check all HVAC controls for proper location, calibration and sequence of operation.
- 3.2.2 Check operation of all controllers and controlled devices to verify proper action and direction. Check the operation of all interlocks.
- 3.2.3 Check all motorized face and bypass zone damper motors for leakage when in closed position. If leakage is more than 5%, mechanical contractor shall reset damper linkages.
- 3.2.4 Check all control valves for complete closure and correct action under all operating conditions.
- 3.2.5 Check all labs supply and exhaust system controls. Check setback functions.
- 3.3 Air Balancing
- 3.3.1 Leakage tests on ductwork must have been completed before air balancing.
- 3.3.2 Set dampers, volume controls and fan speeds to obtain specified air delivery with minimum noise level. Rebalance as required to accomplish this. Simulate fully loaded filters during test.

- 3.3.3 Set grille deflections as noted on plans. Modify deflections if required to eliminate drafts or objectionable air movement.
- 3.3.4 Record air terminal velocity after completion of balance work.
- 3.3.5 Record final grille and register deflection settings if different from that specified on contract drawings.
- 3.3.6 Record all fan speeds.
- 3.3.7 Balance multizone double duct systems with all air through the cold deck. Recheck for noise level in occupied spaces at 50% bypass.
- 3.3.8 Variable Volume Systems: Measure static pressure at all major branches. Adjust fan controllers for minimum required static pressure at the end of each branch. Report the value of the minimum static pressure that will provide proper air flow in the TAB Report and set the static pressure controller for this value. Balance outlets. Check at both modulated and full cooling condition. Traverse main supply and return ducts. Balance the return system. All branches must be above the minimum required static pressure. The supply fan and return fan must track and deliver the proper air quantity with no objectionable noise. The system must be stable and operate properly at 50% load.
- 3.4 Water Balancing:
- 3.4.1 Verify proper operation of all hydronic system devices to ensure the proper flowrate, flow direction and pressure are maintained.
- 3.4.2 Set balancing cocks and flow control devices to obtain specified water flow rates to all terminal units, coils, chillers, cooling towers, boilers, and heat exchangers. Coordinate with variable speed drives to achieve balance with minimum pump speed. Report the value of the minimum differential pressure that will provide proper flow in the TAB Report and set the differential pressure controller for this value. Pump balancing cocks (if present) shall be fully open. Set maximum speed control for variable speed pumps.
- 3.4.3 Impeller Trim: Record the initial suction and discharge pressure and flow rate of each pump with all cocks fully open. The Engineer will compare this data with the "balanced system" data and will determine if pump impellers should be trimmed for the piping system as installed. Impeller trimming, if required, will be accomplished by change order. Additional TAB work to accomplish impeller trimming shall be performed at no additional cost to the Owner.
- 3.4.4 Variable Speed Pumps: Verify proper operation of variable speed pumps and the associated distribution system at 50% and 100% flow.
- 3.5 Boiler Performance
- 3.5.1 Boilers shall be operating at greater than 50% of full load.
- 3.5.2 Record the following in addition to other requirements:
1. Boiler nameplate data.

2. Setting of all safety and operating controls.
3. Stack temperature.
4. CO₂ reading in flue gas.
5. Stack smoke.
6. Gas burner pressure.
7. Gas flow.

3.5.3 Calculate the following:

1. Combustion efficiency in %.
2. Boiler output in Btu/hr (500 x GPM X DT).
3. Boiler input in Btu/hr (CFH x HV).
4. Boiler efficiency in % (Output/Input).

3.5.4 Coordination:

1. Coordinate with the boiler factory-trained representative for performance tests.
2. Temperatures and flow rates are required to be recorded elsewhere in this section. These data may be used for the performance calculations provided steady state conditions are established at the required load, and all systems have been balanced and are operating as specified.

3.5.5 Abbreviations:

1. GPM - gallons per minute.
2. DT - temperature difference across boiler.
3. CFH - cubic feet of gas per hour.
4. HV - heating value of gas (Btu/cu. ft.). Obtain from gas company.

3.6 Chiller Performance:

3.6.1 Chiller shall be operating at full load (plus or minus 10%).

3.6.2 Record the following in addition to other requirements:

1. Chiller nameplate data.
2. Compressor head pressure and suction pressure.

3. Refrigerant liquid and suction temperature.
4. Type of refrigerant and charge.
5. Oil pressure.
6. Unit kW consumption (not only amp draw).
7. Ambient air temperature.

3.6.3 Calculate the following:

1. Chiller output in tons ($500 \times \text{GPM} \times \text{DT}/12,000$).
2. Chiller EER at test conditions in Btu/watt hr ($\text{Output tons} \times 12/\text{kW}$).

3.6.4 Coordination:

1. Coordinate with the chiller factory-trained representative for performance tests.
2. Temperatures and flow rates are required to be recorded elsewhere in this section. These data may be used for the performance calculations provided steady state conditions are established at the required load, and all systems have been balanced and are operating as specified.

3.6.5 Abbreviations:

1. GPM - gallons per minute.
2. DT - temperature difference across chiller.
3. TONS- 12,000 Btu/hr.
4. kW - kilowatts (1,000 watts).

3.7 Data Collection:

3.7.1 In addition to the data required for any specified performance tests, measure and record the temperatures, pressures, flow rates, and nameplate data for all components listed herein.

3.7.2 It is the intent of this section to record data on balanced systems, under normal operating or design conditions.

3.7.3 Temperatures:

1. Outside dry and wet bulb temperatures.
2. Dry bulb temperature in each room and at least one wet bulb temperature in each zone.
3. Refrigerant liquid and suction temperatures.

4. Inlet and outlet temperature of each heat exchange device - both fluids.

3.7.4 Pressures:

1. Suction and discharge static pressure of each fan.
2. Suction and discharge pressure of each pump.
3. Each refrigerant suction and discharge pressure.
4. Water pressure drop through each heat exchanger.

3.7.5 Flow rates:

1. Flow rate through each fan.
2. Flow rate through each pump.
3. Flow rate through each coil or heat exchange device.

3.7.6 Nameplate Data:

1. Complete nameplate data for all equipment.
2. Motor data to include horsepower, phase, voltage, RPM, full load nameplate current, fuse rating in disconnect switch, number or manufacturer's size designation, and ampere rating of overcurrent and low voltage protection devices in starters.

4 FUME HOOD TESTING

4.1 Conform to all applicable requirements of Parts 1.0, 2.0 and 3.0 herein.

4.2 Ensure room air balance is satisfactory prior to initiating fume hood testing.

4.3 General Requirements:

4.3.1 Each fume hood, when properly installed in a laboratory and connected to an exhaust fan of the proper capacity, shall contain and remove fumes generated within the hood. The face velocity range shall be 100 fpm with the sash fully open 16" open. No reverse flows of air will be allowed along the sides, top, bottom, or front of the hood. The Owner and/or a designated representative may view the tests and successful results are contingent upon concurrence by the Owner and/or the representative.

4.3.2 The performance test requirements listed in this section shall be used for the establishment of baseline performance characteristics for comparison with future periodic evaluations of laboratory chemical fume hoods.

4.4 Performance Test Procedures:

4.4.1 "Properly installed" means that the hood is in an area where there is at least 5 feet clear space

in front for observation of the airflow pattern entering the hood. This area shall be without cross drafts or other air currents exceeding 20 fpm that would affect the hood performance in the area in front and around the hood.

- 4.4.2 Fume hood face velocity shall be verified as follows: with exhaust system on, the quantity of air being exhausted shall be determined by measuring the velocity of air entering the hood face and multiplying this velocity by the square feet of hood opening. The hood sash shall be in the fully raised 16" open position. The air velocity shall be determined by averaging at least nine velocity readings taken at the hood face. Readings shall be taken in the center of a grid made up of 3 sections across the middle of the hood face and 3 sections each across the bottom and top of the hood face. Readings shall not vary more than ± 10 fpm from the average face velocity. Report all readings in the TAB Report.
- 4.4.3 When the selected face velocity has been established, a smoke bomb (one-half minute size, as available from E. Vernon Hill Company, San Francisco, California) shall be discharged within the hood area to show the exhaust capability of the hood and its design efficiency. No reverse air flows will be permitted. Place lighted bomb in the hood area and move it to various places, meanwhile checking end panels and working surface to verify that no reverse air flows exist at any point. Lower the sash to closed position to verify that a sufficient air volume is flowing through the hood working area to carry away fumes from a massive fume source. Immediately after the smoke bomb stops discharging smoke, the hood area shall be purged of smoke. Report results in the TAB Report.
- 4.4.4 Lower sash to a point 6 inches above work surface. Velocity, as measured at three points across the reduced face opening, shall be at least two times but less than three times the design face velocity when the sash was fully raised. Report all readings in the TAB Report.
- 4.4.5 With the sash still at the 6 inch open position, the exhaust air volume (indicated as a function of the average velocity determined in the duct with the pitot tube) shall be essentially the same as when the sash was fully raised. Measure exhaust flow in the duct with the sash fully open and fully closed. Total exhaust flow shall be essentially the same as measured previously with the different sash opening positions.
- 4.4.6 Check sash operation by raising and lowering sash. Sash shall glide smoothly and freely, and hold at any height without creeping, assuring proper counterbalance. No metal-to-metal contact shall be allowed between the sash and the sash track.
- 4.4.7 Raise the hood sash and verify that the sash does not enter the auxiliary changer and that there is no appreciable opening or means by which auxiliary air can enter hood either behind the sash or through the bypass until the sash is lowered to the point of bypass opening.
- 4.4.8 With the exhaust system off, turn on auxiliary air system and adjust the supply air volume to the scheduled value. The auxiliary air volume shall be determined with the pitot tube.
- 4.4.9 Measure the air velocity along a line 3" out from the face of the hood and at a height equal to the bottom of the sash when the sash is in a fully raised position. The velocity should not exceed 200 fpm along this line.
- 4.4.10 Turn on the exhaust system and operate at the average face velocity specified. Maintain auxiliary air operation. This will provide the desired ratio of auxiliary air to room air being exhausted by the hood.

- 4.4.11 Introduce a 1-minute smoke bomb into the auxiliary air system prior to the point that air enters the plenum and observe the air pattern. Smoke must indicate a smooth uniform air pattern leaving the auxiliary air discharge and smoke must be efficiently entrained and exhausted by the hood when the sash is fully raised.
- 4.4.12 Repeat smoke bomb test, but with the sash in fully closed position. Smoke must be efficiently captured by air entering the bypass.
- 4.5 All test openings in ductwork shall be resealed in an approved manner.

END OF SECTION 230593

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
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SECTION 23 07 13 - EXTERIOR INSULATION FOR DUCTWORK

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Approval Submittals:

1.3.1 Product Data: Submit producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

Rigid duct insulation
Flexible duct insulation

1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Knauf, Owens-Corning, Johns Manville, Certainteed.

2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, coverings, sealers, mastic, and adhesive) with a flame spread rating of 25 or less, and a smoke-developed rating of 50 or less as tested by ANSI/ASTM 84.

2.3 Rigid Fiberglass Insulation Board: ASTM C612, Class 1 (non load bearing). Boards shall be 3 pcf density with UL rated aluminum foil vapor barrier (FSK).

2.4 Flexible Fiberglass Insulation: ASTM C553, Type I, Class B-3 (temperature less than 350°F). Duct wrap shall be 1 pcf density with UL rated aluminum foil vapor barrier (FSK).

2.5 General Purpose Mastic: Benjamin Foster 35-00 Series, Insulcoustic VIAC Mastic, Childers CP-10, or approved equal. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2.6 Vapor Barrier Sealant: Benjamin Foster 30-35, Insulcoustic IC-501, 3M EC-1378, Childers CP-30, or approved equal. Provide "Low Odor" type. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2.7 Adhesive: Benjamin Foster 85-20, Insulcoustic IC-205, 3M EC-35, Childers CP-82, Childers CP-89, or approved equal. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2.8 Fiber-Glas Mesh: 10x10 Mesh. Foster Mastafab or equal.

3 EXECUTION

3.1 Insulate all rectangular supply, return and outdoor air ductwork exposed in mechanical rooms, mezzanines, fan lofts or in any finished spaces with 1½" thick rigid fiberglass insulation with vapor barrier.

3.2 Installation of Rigid Insulation:

3.2.1 Clean and dry ductwork prior to insulating. Butt insulation firmly together to ensure complete and tight fit over surfaces to be covered. Install insulation materials with smooth and even surfaces. Maintain integrity of aluminum vapor barrier wherever possible. Extend insulation without interruption through walls, floors and similar ductwork penetrations except where otherwise indicated.

3.2.2 Install with facing to the outside with a maximum of 25% compression. Butt all insulation joints firmly together. Longitudinal seam of the vapor retarder must be overlapped a minimum of 2". Staples shall be outward clinch and placed approximately 6" on center. All penetrations, joints, seams, and damage to the facing shall be sealed with glass fabric and mastic prior to system startup. For rectangular ducts over 24" wide, secure the insulation to the bottom of the duct with mechanical fasteners spaced on 12" centers to reduce sag. Do not overcompress the insulation with the retainer. Larger ducts shall be secured with fasteners on 12-inch centers and 3 inches from all edges.

3.2.3 Apply open mesh glass fabric embedded in vapor barrier mastic. Then apply a second coat of general purpose mastic with aluminum grey color. This finish shall be complete over all rigid insulation.

3.3 Insulate all supply, return and outdoor air ductwork concealed above ceilings, in chases, or elsewhere, and the backs of all ceiling supply outlets with 2" thick fiberglass blanket insulation with vapor barrier.

3.3.1 Installation of Flexible Insulation:

3.3.1.1 Insulate round elbows and fittings with wrap such that thickness is equal to adjoining duct covering. Clean and dry ductwork prior to insulating.

3.3.1.2 Adhere insulation to duct with 50 percent coverage using approved insulation adhesive applied in 6-inch wide swaths with 6-inch spaces between swaths. Additionally secure insulation with perforated pins and Tuff-Bond or by self-sticking pins with a 3/8" self-tapping screw. Space on 12-inch centers and 3 inches from all edges. Ducts up through 24" wide only require one row of pins. Ducts over 24" wide shall have pins spaced as described herein.

3.3.1.3 Lap all joints 2 inches and seal joints with 4-inch wide strips of open mesh glass fabric embedded in two coats of general purpose mastic.

3.3.1.4 Seal all punctures and breaks in aluminum vapor barrier with open mesh glass fabric and vapor barrier sealant.

END OF SECTION 23 07 13

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**PANAMA CITY TERMINAL EXPANSION
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SECTION 23 07 16 - INSULATION FOR HVAC EQUIPMENT AND PIPING

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods Sections apply to work of this section.

1.3 Approval Submittals:

1.3.1 Product Data: Submit producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

1.3.1.1 Fiberglass pipe insulation

1.3.1.2 Cellular glass pipe above ground insulation

1.3.1.3 Cellular glass pipe below ground insulation

1.3.1.4 Cellular glass equipment insulation

1.3.1.5 Calcium silicate piping insulation

1.3.1.6 Calcium silicate equipment insulation

1.3.1.7 Flexible unicellular piping insulation

1.3.1.8 Fiberglass equipment insulation

1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Armstrong, Johns Manville, Knauf, Owens Corning, Pittsburgh Corning, U.S. Rubber, or approved equal. All products shall be asbestos-free.

2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesive) with a flame-spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.

2.3 Pipe Insulation Materials:

- 2.3.1 Fiberglass Pipe Insulation: ASTM C547, Class 1 unless otherwise indicated. (Preformed sleeving with white all-service jacket, suitable for temperatures up to 450°F)
- 2.3.2 Cellular Glass Pipe Insulation: ASTM C552, Type II, Class 1. (Uncovered.)
- 2.3.3 Flexible Unicellular Pipe Insulation: ASTM C534, Type I. (Tubular, suitable for use to 200°F.)
- 2.3.4 Staples, Bands, Wires, and Cement: As recommended by the insulation manufacturer for applications indicated.
- 2.3.5 Adhesives, Sealers, Protective Finishes: Products recommended by the insulation manufacturer for the application indicated.
- 2.3.6 Bedding Compound for CHW Systems: Provide products to completely cover the piping or equipment being insulated. Products shall be low odor type. Foster 30-45 or Foster 95-50.
- 2.3.7 Jackets: ASTM C921, Type I (vapor barrier) for piping below ambient temperature, Type II (vapor permeable) for piping above ambient temperature. Type I may be used for all piping at Installer's option.
- 2.3.8 Calcium Silicate Pipe Insulation: ASTM C533, Type I with pre-sized glass cloth jacket.
- 2.4 Equipment Insulation Materials:
- 2.4.1 Rigid Fiberglass Equipment Insulation: ASTM C612, Class 1. (Boards, non-loading bearing, suitable for use to 400°F.)
- 2.4.2 Flexible Fiberglass Equipment Insulation: ASTM C553, Type I, Class B-3. (Flexible blankets suitable for use to 350°F, 1 pcf).
- 2.4.3 Cellular Glass Equipment Insulation: ASTM C552, Type I (Flat, uncovered blocks.)
- 2.4.4 Jacketing Material for Equipment Insulation: Provide 8 ounce canvas jacket, except as otherwise indicated.
- 2.4.5 Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
- 2.4.6 Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape corner angles, anchors, stud pins and metal covers as recommended by insulation manufacturer for applications indicated.
- 2.5 Breeching, Emergency Generator Exhaust and Stack Insulation Materials:
- 2.5.1 Calcium Silicate Blocks: ASTM C533, Type I suitable for use up to and including 1200 °F.
- 2.5.2 Jacketing Material for Breeching and Stack Insulation: Provide 8 ounce canvas jacket except as otherwise indicated.

2.5.3 Breeching and Stack Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

2.5.4 Breeching and Stack Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

3 EXECUTION

3.1 General:

3.1.1 Install thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

3.1.2 Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.

3.1.3 Maintain integrity of vapor-barrier on insulation and protect it to prevent puncture and other damage. Label all insulation "ASBESTOS FREE".

3.1.4 Do not apply insulation to surfaces while they are hot or wet.

3.1.5 Do not install insulation until systems have been checked and found free of leaks. Surfaces shall be clean and dry before attempting to apply insulation. A professional insulator with adequate experience and ability shall install insulation.

3.1.6 Do not install insulation on pipe systems until acceptance tests have been completed except for flexible unicellular insulation. Do not install insulation until the building is "dried-in".

3.2 Fiberglass Pipe Insulation:

3.2.1 Insulate the following piping systems (indoor locations):

3.2.1.1 Heating hot water: up to 2" pipe - 1½" thick, over 2" pipe 2" thick.

3.2.1.2 Heat recovery: up to 2" pipe - 1½" thick, over 2" pipe 2" thick.

3.2.2 Apply insulation to pipe with all side and end joints butted tightly. Seal longitudinal lap by pressurizing with plastic sealing tool. Apply 3 inch wide self sealing butt strips to joints between insulation sections. Insulate all fittings, flanges, valves and strainers with premolded insulation. Apply coat of insulating cement to fittings and wrap with glass cloth overlapping each wrap 1" and adjacent pipe 2". Finish with heavy coat of general purpose mastic. Premolded PVC covers may also be used, but no flexible inserts are allowed.

3.2.3 Provide hanger or pipe support shields of 16 gauge (minimum) galvanized steel over the insulation which extends halfway up the pipe insulation cover and at least 6" on each side of the hanger.

3.2.4 Omit insulation on unions, flanges, strainer blowoffs, flexible connections and expansion joints.

3.3 Cellular Glass Pipe Insulation (Above Ground):

3.3.1 Insulate the following piping systems:

3.3.1.1 Chilled water: smaller than 6" pipe - 1½" thick, 6" and larger pipe - 2" thick.

3.3.1.2 Heating hot water: smaller than 6" pipe - 1½" thick, 6" and larger pipe - 2" thick.

3.3.1.3 Process cooling water: smaller than 6" pipe - 1½" thick, 6" and larger pipe - 2" thick.

3.3.1.4 Heat recovery: smaller than 6" pipe - 1½" thick, 6" and larger pipe - 2" thick.

3.3.2 Indoor Concealed Locations: Cut insulation in sections at fittings and carefully fit to the pipe and fittings. No stovepipe or single miter insulation is allowed. Apply cellular glass bedding compound to the pipe surface to achieve 100% coverage (chilled water piping only). Apply vapor barrier mastic to all edges of the cellular insulation and between joints in the insulation. Wire the cellular glass in place with stainless steel wire 9 inches on center. Provide hanger or pipe support shields of 16 gauge (minimum) galvanized steel over or embedded in the insulation which extend halfway up the pipe insulation cover and at least 4" on each side of the hanger. Insulate anchors adequately to prevent moisture condensation problems. Finish cellular glass insulation in concealed locations by applying a white fire rated jacket with self sealing lap. Finish elbows and fittings with weather barrier sealant reinforced with white glass fabric.

3.3.3 Indoor Exposed, Mechanical Rooms, Manholes, and Outdoor Locations: Cut insulation in sections at fittings and carefully fit to the pipe and fittings. No stovepipe or single miter insulation is allowed. Apply cellular glass bedding compound to the pipe surface to achieve 100% coverage (chilled water piping only). Apply vapor barrier mastic to all edges of the cellular insulation and between joints in the insulation. Wire the cellular glass in place with stainless steel wire 9 inches on center. Provide hanger or pipe support shields of 16 gauge (minimum) galvanized steel over or embedded in the insulation which extend halfway up the pipe insulation cover and at least 4" on each side of the hanger. Insulate anchors adequately to prevent moisture condensation problems. Finish cellular glass by applying a heavy coat of weather barrier sealant reinforced with white glass fabric to the exterior of the cellular glass. Cover straight piping with 0.016" thickness smooth aluminum jacket fastened with aluminum bands on not over 12" centers. Use factory-made 0.014" aluminum covers for fittings and valves. Provide removable end caps for strainers. Metal jacketing shall be applied with the longitudinal seam positioned to shed water.

3.4 Cellular Glass Pipe Insulation (Underground):

3.4.1 Insulate the following piping systems:

3.4.1.1 Chilled water: smaller than 6" pipe -1½" thick, 6" and larger pipe -2" thick.

3.4.1.2 Heating hot water: smaller than 6" pipe -1½" thick, 6" and larger pipe -2" thick.

3.4.1.3 Process cooling water: smaller than 6" pipe -1½" thick, 6" and larger pipe -2" thick.

- 3.4.1.4 Heat recovery: smaller than 6" pipe -1½" thick, 6" and larger pipe -2" thick.
- 3.4.2 Cut insulation in sections at fittings and carefully fit to the pipe and fittings. No stovepipe or single miter insulation is allowed. Apply cellular glass bedding compound to the pipe surface to achieve 100% coverage (chilled water piping only) . Apply vapor barrier mastic to all edges of the cellular insulation and between joints in the insulation. Wire the cellular glass in place with stainless steel wire 9 inches on center. Finish with a prefabricated water barrier self-sealing jacket similar to Pittsburg Corning "Pittwrap SSII", 70 mils thickness. Insulate all anchors, guides, wall penetrations, expansion joints, loops and ells in accordance with the manufacturer's recommendations. Use rubber spacers at all expansion fittings.
- 3.5 Cellular Glass Equipment Insulation:
 - 3.5.1 Insulate the following equipment:
 - 3.5.1.1 Chilled water pumps -2" thick.
 - 3.5.1.2 Chilled water compression tank -1½" thick.
 - 3.5.1.3 Water chiller, chiller heads, float chamber -2" thick.
 - 3.5.1.4 Hot water expansion tank -1½" thick.
 - 3.5.1.5 Hot water storage heater -3" thick.
 - 3.5.1.6 Hot water heat exchanger - 3" thick.
 - 3.5.2 Carefully cut and fit blocks to curvature of the surface of the equipment in staggered joint fashion. For pumps and other equipment requiring maintenance access, fabricate boxes with removable insulation sections. Chilled water equipment metal surfaces in contact with cellular glass shall be carefully covered with bedding mastic, except pumps and other equipment requiring maintenance access. Apply vapor barrier mastic to all edges and joints in the insulation. Fasten insulation in place with stainless steel wire 9" on centers. Provide heavy coat of vapor barrier sealant over the cellular glass. Embed a layer of open weave glassfab cloth in mastic; overlap joints at least two inches and smooth surfaces. Apply a finish coat of machinery grey general purpose mastic heavy enough to hide weave in cloth and finish to smooth surface.
- 3.6 Calcium Silicate Piping Insulation:
 - 3.6.1 Insulate the following piping systems:
 - 3.6.1.1 Steam piping: 3½" thick.
 - 3.6.1.2 Condensate piping: 2½" thick.
 - 3.6.1.3 Piping operating greater than 400°F: " thick.
 - 3.6.2 Insulate with preformed sectional pipe covering and presized glass cloth jacket. Apply insulation using the staggered joint method for both single and double layer construction,

where feasible. Apply each layer of insulation separately. Butt insulation joints firmly together to ensure a complete and tight fit over surfaces to be covered. Cover valves and fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Use insulating finish cement and provide 8 ounce canvas jacket. Provide properly-sized welded-on insulation protection saddles.

3.7 Calcium Silicate Equipment Insulation:

3.7.1 Insulate the following equipment:

3.7.1.1 Breeching and stacks: 2" thick.

3.7.1.2 Emergency generator exhaust pipe: 2" thick.

3.7.1.3 Hot surfaces above 400°F: " thick.

3.7.2 Insulate with 5/8" vee rib spacing lath with molded blocks wired over the spacing lath. Apply poultry wire over the blocks and trowel on a 1/2" coat of insulating finish cement. Finish coat shall be smoothed and covered with glass cloth jacketing neatly fitted and firmly secured. Lap seams at least 2".

3.7.3 Protect outdoor insulation with weather-barrier mastic protective finish and 0.016" aluminum jacket with aluminum bands on 12" centers.

3.8 Flexible Unicellular Pipe Insulation:

3.8.1 Insulate the following piping systems:

3.8.1.1 Condensate drains from air conditioning units - 1/2" thick.

3.8.1.2 Refrigerant piping - 3/4" thick.

3.8.1.3 Air compressor after-cooler piping - 3/4" thick.

3.8.1.4 Process cooling water: 1/2" thick.

3.8.2 Apply insulation in accordance with the manufacturer's recommendations and instructions. Mitre cut insulation to fit pipe fittings. Use approved cement to seal all joints and ends in the insulation.

3.8.3 Insulation outside the building shall be protected by a smooth 0.016" thickness aluminum jacket secured with aluminum bands on 12" centers.

END OF SECTION 23 07 16

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SECTION 23 09 23 - DIRECT DIGITAL CONTROLS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Extent of Energy Management Control and DDC Systems (EMCS/DDC) work required by this section is indicated on drawings and input/output schedules, and by requirements of this section.
- 1.4 Refer to other Division-23 sections for installation of instrument wells, valve bodies and dampers in mechanical systems; not work of this section.
- 1.5 Refer to Division-26 sections for the following work; not work of this section. Power supply wiring for power source to power connection on controls and/or EMCS panels. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
- 1.6 Provide the following electrical work as work of this section, complying with requirements of Division-26 sections: Control wiring between field-installed controls, equipment, indicating devices, and EMCS/DDC panels.
- 1.7 Codes and Standards:
 - 1.7.1 Electrical Standards: Provide electrical products which have been tested, listed and labeled by UL and comply with NEMA standards.
 - 1.7.2 NEMA Compliance: Comply with NEMA standards pertaining to components and devices for electric control systems.
 - 1.7.3 NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.
 - 1.7.4 Federal Communication Commission (FCC) as required.
- 1.8 Approval Submittals:
 - 1.8.1 Product Data: Submit manufacturer's technical product data for each EMCS/DDC panel and control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials. Include installation instructions and start-up instructions. Provide technical specification data for each component and software module.
 - 1.8.2 Shop Drawings: Submit shop drawings for the EMCS/DDC containing the following

information:

- 1.8.2.1 Schematic flow diagram of system showing fans, pumps, coils, dampers, valves, and control devices.
- 1.8.2.2 Label each control device with setting or adjustable range of control.
- 1.8.2.3 Indicate all required electrical wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed. The point-to-point wiring diagram shall show all interconnections.
- 1.8.2.4 Provide details of faces of EMCS/DDC panels, including controls instruments and labeling.
- 1.8.2.5 Include written description of sequence of operation.
- 1.8.2.6 Provide a scaled floor plan drawing showing location of all conduit, control cabling, junction boxes, control devices, and surge suppression devices.

1.9 Test Reports and Verification Submittals:

- 1.9.1 Submit system verification letter from manufacturers representative stating that all HVAC controls have been checked, calibrated, started up and verified for proper operation. State that the Owner training has been completed and provide a roster of attendees.

1.10 O&M Data Submittals:

- 1.10.1 Maintenance Data: Submit maintenance instructions and spare parts lists for each type of control device. Include that type data, and a copy of all approval submittals in O&M Manual.
- 1.10.2 System Manual: In addition to the maintenance data requirements, provide an EMCS/DDC Owner's Manual in a separate binder specifically for this project. This manual shall provide a description of the information flow to and from panels and devices and shall describe the overall communications network. The manual shall also include operating instructions, block diagrams, schematics, schedules, and system descriptions. Instruct Owner's personnel with this manual during the required training periods.
- 1.10.3 Software: Submit a copy of all software.
- 1.10.4 Service: Submit name, address, and telephone number of company that will provide service and training for the system.
- 1.10.5 As-Built Drawings: Provide a scaled floor plan drawing showing location of all conduit, control cabling, junction boxes, control devices, and surge suppression devices.

2 PRODUCTS

- 2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide EMCS/DDC control systems of one of the following:

Trane

- 2.2 General: Provide EMCS/DDC control products in sizes and capacities indicated, consisting of valves, dampers, sensors, controllers and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard control system components as indicated by published product information, designed and constructed as recommended by manufacturer. Provide an EMCS/DDC controls system with the following functional and construction features as indicated. Communications between System Controllers and sub-networks of Custom Application Controllers and/or Application Specific Controllers shall utilize BACnet MSTP (RS485) communications.
- 2.2.1 Each System Controller shall perform communications to a network of Custom Application and Application Specific Controllers using BACnet/MSTP (RS485) as prescribed by the BACnet standard. Each System Controller shall function as a BACnet Router to each unit controller providing a unique BACnet Device ID for all controllers within the system.
- 2.2.2 The Controls Contractor shall provide all communication media, connectors, repeaters and network switches routers necessary for the high speed Ethernet communications network.
- 2.2.3 All values within the system (i.e. schedules, datalogs, points, software variables, custom program variables) shall be readable and controllable (where appropriate) by any System Controller or BACnet Workstation on the communications network via BACnet.
- 2.3 Quality Assurance:
- 2.3.1 Provide equipment of firms regularly engaged in manufacture of EMCS/DDC equipment, of types required, whose products have been in satisfactory use in similar service for not less than three years. Provide evidence that software has been in use satisfactorily for at least one year.
- 2.3.2 Contractor shall have at least three years experience in the installation and servicing of EMCS/DDC equipment similar to that being installed. Contractor shall have an office within 100 miles of the project and shall maintain a remote terminal capable of communication with the EMCS/DDC during the year warranty period.
- 2.4 Control Valves: Provide factory-fabricated electric control valves of type, body material and pressure class indicated. Where type or body material is not indicated, provided selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature rating of piping system. Provide valve size in accordance with scheduled or specified maximum pressure drop across control valve. Except as otherwise indicated, provide valves which mate and match material of connecting piping. Equip control valves with control valve motors with proper shutoff ratings for each individual application.
- 2.4.1 Water Service Valves: Equal percentage characteristics with rangeability of 50 to 1, and maximum full flow pressure drop of 10 feet head unless otherwise indicated. Two-way valves shall be suitable for dead-end service.
- 2.4.2 Single-Seated Valves: Cage type trim, providing seating and guiding surfaces for plug on "top and bottom" guided plugs.
- 2.4.3 Double-Seated Valves: Balanced plug-type, with cage type trim providing seating and guiding surfaces for plugs on "top and bottom" guided plugs.

- 2.4.4 Valve Trim and Stems: Polished stainless steel.
- 2.4.5 Packing: Spring-loaded Teflon, self-adjusting.
- 2.4.6 Terminal Unit Control Devices: Provide compact electric control valves for control of terminal units including, but not necessarily limited to convectors, unit heaters, finned tube radiation, reheat coils, and fan coil units that are of integral motor type. Provide modulating type valves. Valve actuators shall be 24 volts .
- 2.5 Dampers: Refer to Division-23 Section “Ductwork Accessories” for dampers. Actuators are work of this section.
- 2.6 Actuator Motors: Size each motor to operate dampers or valves with sufficient reserve power to provide smooth modulating action or two position action as specified.
- 2.6.1 Provide permanent split-capacitor or shaded pole type motors with gear trains completely oil-immersed and sealed. Equip spring-return motors, where indicated on drawings or in operational sequence, with integral spiral-spring mechanism. Furnish entire mechanism in housing designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
- 2.6.2 Equip motors for outdoor locations and for outside air intakes with “O-ring” gaskets designed to make motors completely weatherproof, and equip with internal heaters to permit normal operation at 10°F.
- 2.6.3 Furnish non-spring return motors for dampers larger than 25 sq. ft. and for valves larger than 2½”. Size for running torque rating of 150 inch-pounds and breakaway torque rating of 300 inch-pounds. Size spring-return motors for running torque rating of 150 inch-pounds and breakaway torque rating of 150 inch-pounds.
- 2.7 EMCS/DDC Associated Components:
- 2.7.1 Provide field-programmable microprocessor-based, stand-alone EMCS/DDC panels as specified herein. The EMCS/DDC panel manufacturer shall be responsible for the complete engineering of the panel. The panel shall be UL listed and housed in a key locked metal cabinet. Parts shall be plug in (modular) for easy repair or expansion. Power input shall be 24V or 120 V. Relays and contacts shall be rated at 24 VA at 24 VAC or 125 VA at 120 and 230 VAC, as required.
1. The System Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 2. The controller shall provide a USB communications port for connection to a PC
 3. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
 4. All System Controllers shall have a real time clock.
 5. Data shall be shared between networked System Controllers.
 6. The System Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
 - a. Assume a predetermined failure mode.
 - b. Generate an alarm notification.

- c. Create a retrievable file of the state of all applicable memory locations at the time of the failure.
- d. Automatically reset the System Controller to return to a normal operating mode.
- 7. Environment. Controller hardware shall be suitable for the anticipated ambient conditions. Controller used in conditioned ambient shall be mounted in an enclosure, and shall be rated for operation at -40 F to 122 F.
- 8. Clock Synchronization.
 - a. All System Controllers shall be able to synchronize with a NTP server for automatic time synchronization.
 - b. All System Controllers shall be able to accept a BACnet time synchronization command for automatic time synchronization.
 - c. All System Controllers shall automatically adjust for daylight savings time if applicable.
- 9. Serviceability
 - a. Provide diagnostic LEDs for power, communications, and processor.
 - b. The System Controller shall have a display on the main board that indicates the current operating mode of the controller.
 - c. All wiring connections shall be made to field removable, modular terminal connectors.
 - d. The System controller shall utilize standard DIN mounting methods for installation and replacement.
- 10. Memory. The System Controller shall maintain all BIOS and programming information indefinitely without power to the System controller
- 11. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage
- 12. BACnet Test Labs (BTL) Listing. Each System Controller shall be listed as a Building Controller (B-BC) by the BACnet Test Labs.

2.8 EMCS/DDC Functions: Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at the operator interface.

- 1. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each of these schedules shall include the capability for start, stop, optimal start, optimal stop, and night economizer actions. Each schedule may consist of up to [10] events. When a group of objects are scheduled together, provide the capability to define advances and delays for each member. Each schedule shall consist of the following:
 - a. Weekly Schedule. Provide separate schedules for each day of the week.
 - b. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. This exception schedule shall override the standard schedule for that day. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed it will be discarded and replaced by the standard schedule for that day of the week.
 - c. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
 - d. Optimal Start. The scheduling application outlined above shall support an optimal start algorithm. This shall calculate the thermal characteristics of a zone and start the equipment prior to occupancy to achieve the desired space temperature at the

specified occupancy time. The algorithm shall calculate separate sets of heating and cooling rates for zones that have been unoccupied for less than and greater than 24 hours. Provide the ability to modify the start algorithm based on outdoor air temperature. Provide an early start limit in minutes to prevent the system from starting before an operator determined time limit.

2. Trend Log Application
 - a. Trend log data shall be sampled and stored on the System Controller panel and shall be capable of being archived to a BACnet Workstation for longer term storage.
 - 1) Trend logs shall include interval, start-time, and stop-time.
 - 2) Trend log intervals shall be configurable as frequently as 1 minute and as infrequently as 1 year.
 - b. Automated Trend Logs.
 - 1) The system controller shall automatically create trend logs for defined key measurements for each controlled HVAC device and HVAC application.
 - 2) The automatic trend logs shall monitor these parameters for a minimum of 7 days at 15 minute intervals. The automatic trend logs shall be user adjustable.
3. Alarm/Event Log
 - a. Any object in the system shall be configurable to generate an alarm when transitioning in and out of a normal or fault state.
 - b. Any object in the system shall allow the alarm limits, warning limits, states, and reactions to be configured for each object in the system.
 - c. An alarm/event shall be capable of triggering any of the following actions:
 - 1) Route the alarm/event to one or more alarm log. The alarm message shall include the name of the alarm location, the device that generated the alarm, and the alarm message itself.
 - 2) Route an e-mail message to an operator(s)
 - 3) Log a data point(s) for a period of time
 - 4) Run a custom control program
4. VAV System Coordination. Provide applications software to properly coordinate and control the VAV system to ensure equipment safety and minimize energy use. This application shall perform the following functions:
 - a. Startup and shutdown the air handler safely. Ensure the VAV boxes are open sufficiently when the air handler is running, to prevent damage to the ductwork and VAV boxes due to high air pressure.
 - b. Calibrate VAV boxes.
 - c. Fan Pressure Optimization (ASHRAE 90.1) - Minimize energy usage by controlling system static pressure to the lowest level while maintaining zone airflow requirements. System static pressure controlled to keep the "most open" zone damper between 65% and 75% open.
 - 1) The Fan Pressure Optimization application shall have the ability to identify and display the discharge air setpoint of the air-handler and the VAV box that serves the critical zone (e.g., the zone with the most open VAV box damper). This information shall dynamically update with changes in the location of the critical zone.
 - 2) During commissioning, and with the engineer/owner, the controls contractor shall confirm the performance of Fan Pressure Optimization by conducting a field functional test that demonstrates critical zone reset.
5. Point Control. User shall have the option to set the update interval, minimum on/off time, event notification, custom programming on change of events.
6. Timed Override. A standard application shall be utilized to enable/disable temperature control when a user selects on/cancel at the zone sensor, operator interface, or the local

operator display. The amount of time that the override takes precedence will be selectable from the operator interface.

7. Anti-Short Cycling. All binary output points shall be protected from short cycling

2.9

Operator Interface:

1. Operator Interface
 - a. The operator interface shall be accessible via a web browser.
 - b. The operator interface shall support the following Internet web browsers:
 - 1) Internet Explorer 8.0+
 - c. The operator interface shall support the following mobile web browsers:
 - 1) iOS (iPad/iPhone) V4.0+
 - 2) Android (Phone) V2.3+
2. Mobile App Operator Interface
 - a. Mobile App Operator Interface shall support the following Operating systems
 - 1) Apple iOS 5
 - 2) Apple iOS 6
 - 3) Android V2.3
 - 4) Android V4.0
 - 5) Android V4.1
 - b. The operator interface shall support system access on a mobile device via a mobile app to:
 - 1) Alarm log
 - 2) System Status
 - 3) Equipment status
 - 4) Space Status
 - 5) Standard Equipment graphics
 - c. The operator interface shall support actions on a mobile device via a mobile app to:
 - 1) Override set points
 - 2) Override occupancy
 - 3) Acknowledge Alarms
 - 4) Comment on Alarms
 - d. System Security
 - 1) Each operator shall be required to login to the system with a user name and password in order to view, edit, add, or delete data.
 - 2) User Profiles shall restrict the user to only the objects, applications, and system functions as assigned by the system administrator.
 - 3) Each operator shall be allowed to change their user password
 - 4) The System Administrator shall be able to manage the security for all other users
 - 5) The system shall include pre-defined "roles" that allow a system administrator to quickly assign permissions to a user.
 - 6) User logon/logoff attempts shall be recorded.
 - 7) The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.
 - 8) All system security data shall be stored in an encrypted format.
 - e. Database
 - 1) Database Save. A system operator with the proper password clearance shall be able to archive the database on the designated operator interface PC.
 - 2) Database Restore. The system operator shall also be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.

- f. On-Line Help and Training
 - 1) Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.
 - 2) On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.
- g. System Diagnostics
 - 1) The system shall automatically monitor the operation of all network connections, building management panels, and controllers.
 - 2) The failure of any device shall be annunciated to the operators.
- h. Equipment & Application Pages
 - 1) The operator interface shall include standard pages for all equipment and applications. These pages shall allow an operator to obtain information relevant to the operation of the equipment and/or application, including:
 - a) Animated Equipment Graphics for each major piece of equipment and floor plan in the System. This includes:
 - (1) Each Chiller, Air Handler, VAV Terminal, Fan Coil, Boiler, and Cooling Tower. These graphics shall show all points dynamically as specified in the points list.
 - (2) Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions. Graphics shall be capable of launching other web pages.
 - b) Alarms relevant to the equipment or application without requiring a user to navigate to an alarm page and perform a filter.
 - c) Historical Data (As defined in Automatic Trend Log section below) for the equipment or application without requiring a user to navigate to a data log page and perform a filter.
- i. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using colors to represent zone temperature relative to zone set point.
 - 1) Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point and-click navigation between zones or equipment, and to edit set points and other specified parameters.
 - 2) Graphic imagery – graphics shall use 3D images for all standard and custom graphics. The only allowable exceptions will be photo images, maps, schematic drawings, and selected floor plans.
 - 3) Animation. Graphics shall be able to animate by displaying different Image lies for changed object status.
 - 4) Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
 - 5) Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).
- j. Custom Graphics

- 1) The operator interface shall be capable of displaying custom graphics in order to convey the status of the facility to its operators.
- 2) Graphical Navigation. The operator interface shall provide dynamic color graphics of building areas, systems and equipment.
- 3) Graphical Data Visualization. The operator interface shall support dynamic points including analog and binary values, dynamic text, static text, and animation files.
- 4) Custom background images. Custom background images shall be created with the use of commonly available graphics packages such as Adobe Photoshop. The graphics generation package shall create and modify graphics that are saved in industry standard formats such as GIF and JPEG.
- k. Graphics Library. Furnish a library of standard HVAC equipment such as chillers, air handlers, terminals, fan coils, unit ventilators, rooftop units, and VAV boxes, in 3-dimensional graphic depictions. The library shall be furnished in a file format compatible with the graphics generation package program.
- l. Manual Control and Override.
 - 1) Point Control. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system. The point status shall be available by menu, on graphics or through custom programs.
 - 2) Temporary Overrides. The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.
 - 3) Override Owners. The system shall convey to the user the owner of each override for all priorities that an override exists.
 - 4) Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.
- m. Engineering Units
 - 1) Allow for selection of the desired engineering units (i.e. Inch pound or SI) in the system.
 - 2) Unit selection shall be able to be customized by locality to select the desired units for each measurement.
 - 3) Engineering units on this project shall be IP.
3. Scheduling. A user shall be able to perform the following tasks utilizing the operator interface:
 - a. Create a new schedule, defining the default values, events and membership.
 - b. Create exceptions to a schedule for any given day.
 - c. Apply an exception that spans a single day or multiple days.
 - d. View a schedule by day, week and month.
 - e. Exception schedules and holidays shall be shown clearly on the calendar.
 - f. Modify the schedule events, members and exceptions.
4. Trend Logs
 - a. Trend Logs Definition.
 - 1) The operator interface shall allow a user with the appropriate security permissions to define a trend log for any data in the system.
 - 2) The operator interface shall allow a user to define any trend log options as described in the Application and Control Software section.
 - b. Trend Log Viewer.
 - 1) The operator interface shall allow Trend Log data to be viewed and printed.
 - 2) The operator interface shall allow a user to view trend log data in text-based (time –stamp/value).

- 3) The operator shall be able to view the data collected by a trend log in a graphical chart in the operator interface.
- 4) Trend log viewing capabilities shall include the ability to show a minimum of 5 points on a chart.
- 5) Each data point trend line shall be displayed as a unique color.
- 6) The operator shall be able to specify the duration of historical data to view by scrolling and zooming.
- 7) The system shall provide a graphical trace display of the associated time stamp and value for any selected point along the x-axis.
- c. Export Trend Logs.
 - 1) The operator interface shall allow a user to export trend log data in CSV or PDF format for use by other industry standard word processing and spreadsheet packages.
5. Alarm/Event Notification
 - a. An operator shall be notified of new alarms/events as they occur while navigating through any part of the system via an alarm icon.
 - b. Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any operator interface.
 - 1) The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.
 - 2) Alarm/event messages shall use full language, easily recognized descriptors.
 - 3) An operator with the proper security level may acknowledge and clear alarms/events.
 - 4) All alarms/events that have not been cleared by the operator shall be stored by the building controller.
 - 5) The alarm/event log shall include a comment field for each alarm/event that allows a user to add specific comments associated with any alarm.
 - c. Alarm Processing.
 - 1) The operator shall be able to configure any object in the system to generate an alarm when transitioning in and out of a normal state.
 - 2) The operator shall be able to configure the alarm limits, warning limits, states, and reactions for each object in the system.
6. Reports and Logs.
 - a. The operator interface shall provide a reporting package that allows the operator to select reports.
 - b. The operator interface shall provide the ability to schedule reports to run at specified intervals of time.
 - c. The operator interface shall allow a user to export reports and logs from the building controller in a format that is readily accessible by other standard software applications including spreadsheets and word processing. Acceptable formats include:
 - 1) CSV, HTML, XML, PDF
 - d. Reports and logs shall be readily printed to the system printer.
 - e. Provide a means to list and access the last 10 reports viewed by the user.
 - f. The following standard reports shall be available without requiring a user to manually configure the report:
 - 1) All Points in Alarm Report: Provide an on demand report showing all current alarms.
 - 2) All Points in Override Report: Provide an on demand report showing all overrides in effect.

- 3) Commissioning Report: Provide a one-time report that lists all equipment with the unit configuration and present operation.
 - 4) Points report: Provide a report that lists the current value of all points
 7. VAV Air System. An operator shall be able to view and control (where applicable) the following parameters via the operator interface:
 - a. System Mode
 - b. System Occupancy
 - c. Ventilation (Outdoor air flow) setpoint
 - d. Ventilation (Outdoor air flow) status
 - e. Air Handler Static pressure setpoint
 - f. Air Handler Static pressure status
 - g. Air Handler occupancy status
 - h. Air Handler Supply air cooling and heating set points
 - i. Air Handler minimum, maximum and nominal static pressure setpoints
 - j. VAV box minimum and maximum flow
 - k. VAV box drive open and close overrides
 - l. VAV box occupancy status
 - m. VAV box Airflow to space
 - n. Average space temperature
 - o. Minimum space temperature
 - p. Maximum space temperature
 8. Chilled Water System. An operator shall be able to view and control (where applicable) the following parameters via the operator interface:
 - a. System mode of the chiller plant
 - b. Chiller enable/disable status
 - c. System supply water setpoint
 - d. System supply and return water temperature
 - e. System Chilled water pump status
 - f. System Chilled water flow
 - g. Bypass pipe flow rate (if applicable)
 - h. Chiller or system failure information
 9. Custom Application Programming. Provide the tools to create, modify, and debug custom application programming. The operator shall be able to create, edit, and download custom programs at the same time that all other system applications are operating. The system shall be fully operable while custom routines are edited, compiled, and downloaded.
 10. Custom Graphic Editor. Provide the tools to create, modify, and debug custom graphics. The operator shall be able to create, edit, and download custom graphics at the same time that all other system applications are operating. The system shall be fully operable while custom graphics are edited, compiled, and downloaded.
- 2.10 Associated Hardware: Provide actuators, relays, and other interface devices as required to execute the indicated control functions.
- 2.11 EMCS/DDC Input Devices:
- 2.11.1 Temperature Sensors: Provide nickel resistance temperature detector (RTD) type sensors for duct, well or room mounting as required by duty indicated. Accuracy: plus or minus 0.5°F.
- 2.11.2 Temperature Transmitters: Provide 3 or 4 wire resistance temperature detector (RTD) type transmitters for duct, well or room mounting as required by duty indicated. Provide metal

enclosure sealed against moisture. Accuracy: plus or minus 0.25°F. Install wells to accommodate sensors. Wells must be of sufficient size to allow insertion of an electronic probe with the sensor for calibration. Accutech AI-1000 or approved equal.

2.11.3 Current Transformers: Provide current transformers (and potential transformers if required) and all associated interface equipment for sensing kW demand.

2.11.4 Humidity Sensors:

2.12 Guarantee:

2.12.1 All components, parts, and assemblies shall be guaranteed against defects in material and workmanship for a period of one year after acceptance. Expressed warranties are conditionally based on the requirement that the items covered within the guarantee are used and maintained in accordance with the manufacturer's recommendations. Guarantee commences at time of acceptance and continues for one year. Acceptance shall not occur until the Owner's operators are able to use the EMCS/DDC and receive reliable information from inputs and outputs.

2.12.2 The first year guarantee shall, as part of the base bid for the EMCS/DDC, include full service and maintenance of the EMCS/DDC. This service and maintenance shall include all necessary repair, reprogramming, calibration, cleaning, minimum (4) quarterly inspections, call back service, etc. This first year service, maintenance and guarantee shall be included in the base bid of the EMCS/DDC.

3 EXECUTION

3.1 Examine areas and conditions under which EMCS/DDC work is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.2 Installation of EMCS/DDC:

3.2.1 General: Install systems and materials in accordance with manufacturer's instructions, shop drawings, and details on drawings. Install electrical components and use electrical products complying with requirements of applicable Division-26 sections of these specifications. Mount panels at convenient locations and heights.

3.2.2 Control Wiring: The term "control wiring" is defined to include wire, conduit and miscellaneous materials as required for mounting and connecting electric control devices. Install all control wiring in conduit. All low voltage control wiring shall be installed in conduit.

3.2.3 Wiring System: Install complete control wiring system for the EMCS/DDC. Conceal wiring, except in mechanical rooms and areas where other conduit and piping are exposed. Provide multi-conductor instrument harness (bundle) in place of single conductors where number of conductors can be run along common path. Fasten flexible conductors bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support conductors neatly.

3.2.4 Install control wiring in accordance with the National Electric Code and Division 26 requirements.

- 3.2.5 Number-code or color-code conductors, excluding those used for local individual room controls, appropriately for future identification and servicing of control system. Tag all sensor wiring to identify zone number and room number where sensor is located.
- 3.2.6 Label all sensors, valves, dampers, safety devices and controllers with engraved tags matching the shop drawings.
- 3.3 Programming of EMCS/DDC:
- 3.3.1 The Contractor shall obtain operational schedules for the controlled equipment from the Engineer. Submittal data relevant to operational schedules shall be forwarded from the Contractor to the Engineer. Upon receipt of approval, the Contractor shall proceed with installation, setup, calibration and check out of the various control and monitoring systems.
- Having completed component and system installation, the Contractor shall submit a written request to the Engineer to inspect and approve their satisfactory operation.
- 3.3.2 The EMCS/DDC shall perform all functions on the equipment as describes in Division-23 section "HVAC Sequence of Operation and as called for in the input/output schedule on the drawings. This, in conjunction with the drawings, defines the scope and extent of the project with regard to the required number of panels, control point relays, and devices. Field verify voltages at point-of-interface and provide relays as required.
- 3.3.3 Channel numbers may be reassigned by the Contractor during shop drawing submittal.
- 3.3.4 Model numbers, horsepower, voltages, and other information equipment where listed on the drawings are for Contractor's convenience. Verify all information in the field as necessary for preparation of shop drawings.
- 3.4 Functional Requirements of EMCS/DDC:
- 3.4.1 Provide all necessary relays, sensors, wiring and contacts to achieve proper operation.
- 3.4.2 Connect EMCS/DDC panels to remote panels where shown.
- 3.4.3 Coordinate EMCS/DDC work with pneumatic control work. Provide compatible equipment.
- 3.5 Adjusting and Cleaning:
- 3.5.1 Startup: Startup, test, and adjust the EMCS/DDC in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- 3.5.2 Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- 3.5.3 Final Adjustment: After completion of installation, adjust the program, relays, interface devices, and similar equipment provided as work of this section for optimum operation.
- 3.6 VFD System Adjustment: The drive/controller supplier shall set all adjustments and setpoints

for initial operation. The hydronic system and all pumps and control valves shall be monitored for proper operation. The ductwork and all fans and terminal units shall be monitored for proper operation. It shall be recognized that final settings will be obtained by trial-and-error by necessity. Call backs to achieve proper settings shall be included in the base bid.

3.7 Owner's Instructions:

3.7.1 During system startup and at such time acceptable performance of the EMCS/DDC hardware and software has been established, the Contractor shall provide on-site operator instruction. This instruction shall be performed during normal working hours and shall be conducted by a competent representative of the Contractor familiar with the system's software, hardware and accessories. The Contractor shall maintain a roster of all attendees at all training sessions.

3.7.2 At a time mutually agreed upon during system training as stated above, the Contractor shall give up to 40 hours (as needed) of instruction to the Owner's designated personnel on the operation of all equipment within the EMCS/DDC and describe its intended use with respect to the programmed functions specified.

3.7.3 Operator orientation of the EMCS/DDC shall include, but not be limited to, the overall operational program, equipment functions both individually and as part of the total integrated system, commands, advisories, and appropriate operator intervention required in responding to the EMCS/DDC operation.

3.7.4 Provide at least 14-day notice to Owner and Engineer of training dates.

3.8 System Verification: The manufacturer's authorized representative shall state in writing to the Engineer that the EMCS/DDC system is operating properly, final adjustments and calibrations are complete, and Owner training has been accomplished.

END OF SECTION 23 09 23

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 21 13 - CHILLED WATER SYSTEMS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Refer to other Division-23 sections for insulation of hydronic piping; not work of this section.
- 1.4 Refer to other Division-23 sections for hydronic specialties; not work of this section.
- 1.5 Refer to other Division-23 sections for testing, adjusting, and balancing of hydronic piping systems; not work of this section.
- 1.6 Codes and Standards: Fabricate and install hydronic piping in accordance with ASME B31.9 "Building Services Piping."
- 1.7 Approval Submittals:
- 1.7.1 Product Data: Submit manufacturer's product data for:
- Valves
Meters and Gauges
- 1.7.2 Shop Drawings: Submit scaled layout drawings of piping systems in mechanical rooms and manholes including, but not necessarily limited to, pipe sizes, location, offsets, connections, elevations, and hydronic specialties. Indicate interface and spatial relationship between piping and equipment. Coordinate with all other trades work and existing conditions. Field verify final location of pipe prior to submittal of layout drawings and fabrication.
- 1.8 Test Reports and Verification Submittals:
- Submit welder's certificates.
Submit water treatment test report.
- 1.9 O&M Manual Submittals: Submit a copy of approval submittals. Include this data in O&M manual.

2 PRODUCTS

- 2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ASME B31.9 Code for Building Services Piping where

applicable, base pressure rating on hydronic piping systems maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in hydronic piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

- 2.2 Basic Identification: Provide identification complying with Division-23 Basic Mechanical Materials and Methods section "Mechanical Identification."
- 2.3 Basic Pipes and Pipe Fittings: Provide pipes and pipe fittings complying with Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:
 - 2.3.1 Pipe Size 2" and Smaller: Black steel pipe; Schedule 40; Class 125 cast-iron fittings with threaded joints.
 - 2.3.2 Tube Size 3" and Smaller: Copper tube; Type L, hard-drawn temper; wrought-copper fittings with soldered joints. Use for runouts to terminal units only.
 - 2.3.3 Pipe Size 2½" and Larger: Black steel pipe; Schedule 40; wrought-steel butt welding fittings with welded joints.
 - 2.3.4 Underground Piping: All underground piping regardless of size shall be welded.
- 2.4 Basic Piping Specialties: Provide piping specialties complying with Division-23 Basic Mechanical Materials and Methods section "Piping Specialties."
- 2.5 Basic Supports and Anchors: Provide supports and anchors complying with Division-23 Basic Mechanical Materials and Methods section "Supports and Anchors."
- 2.6 Basic Valves: Provide valves complying with Division-23 Basic Materials and Methods section "Valves" and the following list:
 - 2.6.1 Standard Service Sectional Valves: Type GA1, GA3, BF1, BF2, BF3, BF4.
 - 2.6.2 Standard Service Shutoff Valves: Type GA1, GA3, BA1, BF2, BF4.
 - 2.6.3 Standard Service Check Valves: Type CK1, CK3.
 - 2.6.4 Standard Service Drain Valves: Type GA1, BA1.
 - 2.6.5 Standard Service Terminal Runout Valves (Steel Runouts): Type GA1, GA3, BA1.
 - 2.6.6 Standard Service Terminal Runout Valves (Copper Runouts): Type GA2, BA2.
 - 2.6.7 High Pressure Service Sectional Valves: Type GA4, GA9.
 - 2.6.8 High Pressure Service Shutoff Valves: Type GA4, GA9, BA1.
 - 2.6.9 High Pressure Service Check Valves: Type CK6, CK7.
 - 2.6.10 High Pressure Service Drain Valves: Type GA4, BA1.

- 2.6.11 High Pressure Service Runout Valves (Steel Runouts): GA4, GA9.
- 2.6.12 High Pressure Service Runout Valves (Copper Runouts): GA5.
- 2.7 Basic Meters and Gauges: Provide meters and gauges complying with Division-23 Basic Mechanical Materials and Methods section "Meters and Gauges", in accordance with the following listing:

Temperature gauges and fittings.
Pressure gauges and fittings.

3 EXECUTION

- 3.1 General: Examine areas and conditions under which hydronic piping systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- 3.2 Installation of Hydronic Piping:
- 3.2.1 General: Install hydronic piping in accordance with Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".
- 3.2.2 Install eccentric reducers where pipe is reduced in size in direction of flow, with tops of both pipes and reducer flush. Do not use bushings.
- 3.2.3 Install piping with 1/32" per foot (¼%) upward slope in direction of flow, or as indicated on the drawings. The intent is to install piping sloped to drains at low points in the system for a drainable system.
- 3.2.4 Connect branch-feed piping to mains at horizontal center line of mains, connect run-out piping to branches at horizontal center line of branches.
- 3.2.5 Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.
- 3.3 Install piping specialties in accordance with Division-23 Basic Mechanical Materials and Methods section "Piping Specialties".
- 3.4 Install supports and anchors in accordance with Division-23 Basic Mechanical Materials and Methods section "Supports and Anchors".
- 3.5 Install valves in accordance with Division-23 Basic Mechanical Materials and Methods section "Valves".
- 3.5.1 Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more hydronic terminals or equipment connections, and elsewhere as indicated.
- 3.5.2 Shutoff Valves: Install on inlet and outlet of each mechanical equipment item, and on inlet and outlet of each hydronic terminal, and elsewhere as indicated.

- 3.5.3 Drain Valves: Install on each mechanical equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain hydronic piping system.
- 3.5.4 Check Valves: Install on discharge side of each pump, and elsewhere as indicated.
- 3.6 Install expansion loops in accordance with Division-23 Basic Mechanical Materials and Methods section "Expansion Compensation".
- 3.7 Install meters and gauges in accordance with Division-23 Basic Materials and Methods section "Meters and Gauges".
- 3.8 Equipment Connections:
- 3.8.1 General: Connect hydronic piping system to mechanical equipment as indicated on the drawings, and comply with equipment manufacturer's instructions where not otherwise indicated. Install shutoff valve and union on supply and return and a drain valve on the drain connection. Connections between dissimilar metals shall be made with dielectric devices.
- 3.9 Provide sufficient swing joints, expansion loops and devices necessary for a flexible piping system. Install drain valves at all low points of each system to enable complete drainage, and air vents at all high points in the piping system to enable complete air venting.
- 3.10 Locate and coordinate installation of access doors for all valves and devices in accordance with Division-23 Basic Mechanical Materials and Methods section "Access Doors".
- 3.11 Testing, Cleaning, Flushing, and Inspecting: Test, clean, flush, and inspect hydronic piping systems in accordance with requirements of Division-23 Basic Mechanical Materials and Methods section "Testing, Cleaning, and Sterilization of Piping Systems."
- 3.12 Chemical Treatment: Fill Refill hydronic piping systems, adding a nitriteborate, MBT based treatment for corrosion protection. Add to establish the levels recommended by the water treatment company, but no less than 500 ppm nitrite and a minimum pH of 8.5. Repeat measurements daily with system under full circulation and apply chemicals to adjust levels until no change is apparent.

END OF SECTION 23 21 13

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 21 14 - CHILLED WATER PREINSULATED PIPING SYSTEM

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.
- 1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Extent of underground preinsulated piping system work, is indicated on drawings and by requirements of this section.
- 1.4 Verify all existing conditions prior to bidding. The Contractor shall include in his price for the underground preinsulated system sufficient elbows, offsets, and pipe to provide for unforeseen conditions. The drawings do not show the exact location or inverts of all existing utilities, conditions, etc. However, the contractor's bid shall include sufficient labor and material costs to allow for these conditions without causing additional cost for the Owner or delays in the project schedule.
- 1.5 Refer to other Division-23 sections for field-applied insulation, manholes, valves, hydronic specialties, and expansion compensation.
- 1.6 Codes and Standards: Fabricate and install piping in accordance with ASME B31.9 "Building Services Piping".
- 1.7 Approval Submittals:
 - 1.7.1 Product Data: Submit manufacturer's technical product data and installation instructions for systems, including: carrier pipe, jacket, insulation, materials and products.
 - 1.7.2 Shop Drawings: Submit scaled layout drawings of underground preinsulated piping system including, but not necessarily limited to, pipe sizes, location, offsets, connections, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Indicate interface and spatial relationship between piping and manholes. Coordinate with all other site utilities and all existing conditions. Field verify final location of pipe prior to submittal of layout drawings and fabrication. Shop drawings shall indicate the existing conditions. Probe or excavate as required.
- 1.8 O&M Data Submittals: Submit a copy of approval submittals for jacket and piping materials and products. Include this data in O&M manual.

2 PRODUCTS

- 2.1 General: Provide factory-fabricated preinsulated piping and insulation products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by manufacturer to comply with installation requirements.

Provide materials and products complying with ASME B31.9 Code for Building Services Piping where applicable, base pressure rating on piping systems maximum design pressures. Provide fittings and materials which match pipe materials used in piping systems.

2.2 Carrier Pipe and Fittings: Provide pipes and pipe fittings complying with Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

2.2.1 Chilled Water Piping: A-53 black steel pipe, Grade B; Schedule 40; ERW, wrought-steel buttwelding fittings, welded joints.

2.2.2 Heating Hot Water Piping: A-53 black steel pipe, Grade B; Schedule 40; ERW, wrought-steel buttwelding fittings, welded joints.

2.3 Outer Jacket:

2.3.1 Jacket: The outer casing shall be high density polyethylene (HDPE) conforming to ASTM D1248 and D3350, Type III, Category 5, Class C and Grade P23/P24. With a minimum of 2% by weight of carbon black. Minimum thickness is 150 mils.

2.3.2 Provide straight lengths of pre-insulated pipe and fittings for field installation. Jackets for fittings shall be of the same construction as the jacket material.

2.3.3 End Seals: Seal each length of pre-insulated pipe with a watertight mastic end seal at the jacket and pipe surfaces. Any field cuts shall be sealed with a field applied end seal per the manufacturer's standard practice.

2.3.4 Anchors: Provide prefabricated 1/2" plate steel anchors attached to the carrier pipe and sealed to the pipe jacketing per manufacturer's standard practice.

2.3.5 Pipe Support Guides: Provide standard manufacturer's full round guides.

2.4 Insulation:

2.4.1 Chilled Water Pipe Insulation: polyurethane foam with minimum K = 0.13 and a density of 2 lb/ft³: smaller than 6" pipe -1½" thick, 6" and larger pipe -2" thick

2.4.2 Insulation shall be complete through all piping, expansion loops and fittings.

2.5 Acceptable Manufacturers: Subject to compliance with requirements, provide preinsulated piping systems of one of the following: Ricwil, Rovanco, Perma Pipe, Thermacor.

3 EXECUTION

3.1 Inspection: Examine areas and conditions under which products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Installation of Underground Piping: Install in accordance with Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings" and "Excavation and Backfill".

3.2.1 Expansion loops and ells: Provide sufficient loops for a flexible piping system in accordance

with ASME Code for pressure piping and the manufacturer's standard practice.

- 3.2.2 Anchors: Provide anchors where shown on the plans or as determined by the manufacturer's recommendations.
- 3.2.3 End seals: Terminate ends of pre-insulated pipe inside building walls and manholes with end seals.
- 3.2.4 After welding and pressure testing, all joints shall be insulated and sealed in accordance with the manufacturer's published methods.
- 3.3 Testing: Carrier pipe shall be pressure tested hydrostatically in accordance with Division-23 Basic Mechanical Materials and Methods section "Testing, Cleaning and Sterilization of Piping Systems" after welding and prior to closure of jacket. All jacket closures shall be field tested with air before backfilling. The Contractor shall provide all necessary equipment for the testing.

END OF SECTION 23 21 14

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 21 16 - HYDRONIC SPECIALTIES

- 1 GENERAL
- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Refer to other Division-15 sections for insulation of hydronic specialties; not work of this section.
- 1.4 Codes and Standards:
- 1.4.1 ASME Compliance: Manufacture and install hydronic specialties in accordance with ASME B31.9 "Building Services Piping".
- 1.5 Approval Submittals:
- 1.5.1 Product Data: Submit manufacturer's technical product data and installation instructions for each type of hydronic specialty. Include pressure drop curve or chart for each type and size of hydronic specialty. Submit schedule indicating manufacturer's figure number, size, location, rated capacities, and features for each required hydronic specialty.
 - 1.5.1.1 Balancing Cocks
 - 1.5.1.2 Vent Valves
 - 1.5.1.3 Air Separators
 - 1.5.1.4 Compression Tanks
 - 1.5.1.5 Diaphragm Type Compression Tanks
 - 1.5.1.6 Shot Feeders
 - 1.5.1.7 Liquid Flow Switches
 - 1.5.1.8 Water Relief Valves
 - 1.5.1.9 Pressure-Reducing Valves
 - 1.5.1.10 Pump Discharge Valves
 - 1.5.1.11 Pump Suction Diffusers

- 1.5.1.12 Flow Control Valves
- 1.5.1.13 Differential Pressure Relief Valves
- 1.5.1.14 Hydronic Bridges
- 1.6 O&M Data Submittals:
 - 1.6.1 Maintenance Data: Submit a copy of approval submittals. Submit maintenance data and spare parts lists for liquid flow switches, pressure-reducing valves, pump differential relief valves, hydronic bridges . Include these data in the O&M manual.
- 2 PRODUCTS
 - 2.1 General: Provide factory-fabricated hydronic specialties recommended by manufacturer for use in service indicated. Provide hydronic specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is installer's option but more than one type cannot be used on project.
 - 2.2 Balance Cocks: Provide balance cocks as indicated, of one of the following types:
 - 2.2.1 Threaded Ends 2" and Smaller: Class 125, bronze body, bronze plug, screwdriver-operated, straight or angle pattern, square head with check pin.
 - 2.2.2 Soldered Ends 2" and Smaller: Class 125, bronze body, bronze plug, screwdriver-operated, straight or angle pattern, square head with check pin.
 - 2.2.3 Flanged Ends 2½" and Larger: Class 175, semi-steel body, lubricated plug valve.
 - 2.2.4 Acceptable Manufacturers: Subject to compliance with requirements, provide balancing cocks of one of the following:
 - Milliken Figure 200R and 201R
 - Powell Figure 2200 and 2201
 - Taco Model MPV
 - Wheatley Model TDV
 - 2.3 Vent Valves:
 - 2.3.1 Manual Vent Valves: Provide manual vent valves designed to be operated manually with screwdriver or thumbscrew, c" N.P.T. connection.
 - 2.3.2 Automatic Vent Valves: Provide automatic vent valves designed to vent automatically with float principle, stainless steel float and mechanisms, brass cast iron body, pressure rated for 150 psi, ¾" NPS inlet connection. Hoffman No. 78 Hoffman No. 792. Use for central plant equipment.

- 2.3.3 Automatic Vent Valves: Provide automatic vent valves designed to vent automatically with float principle, stamped brass body, pressure rated for 150 psi, ½" NPS inlet connection. Bell & Gossett No. 87. Use for all distribution piping.
- 2.3.4 Acceptable Manufacturers: Subject to compliance with requirements, provide vent valves of one of the following:
- Crane
 - Bell & Gossett
 - Hoffman
 - Sarco
 - Wheatley
- 2.4 Air Separators: Provide air separators pressure rated for 125 psi. Select capacity based on total system gpm.
- 2.4.1 Dip Tube Fittings: Provide dip tube fittings in boilers as indicated to prevent free air collected in boiler from rising into system.
- 2.4.2 In-Line Air Separators: Provide in-line air separators with tangential nozzles and stainless steel air collector tube as indicated. Construct sizes 1½" and smaller of cast iron; and sizes 2" and larger of steel complying with ASME Boiler and Pressure Vessel Code and stamped with "U" symbol. Furnish National Board Form U-1 denoting compliance.
- 2.4.3 Acceptable Manufacturers: Subject to compliance with requirements, provide air separators of one of the following:
- Amtrol, Inc.
 - Bell & Gossett
 - John Wood Co.
 - Wheatley
- 2.5 Compression Tanks: Provide compression tanks of size and number as indicated. Construct of steel for 125 psi pressure rating complying with ASME Boiler and Pressure Vessel Code and stamped with "U" symbol. Furnish National Board Form U-1 denoting compliance. Provide tappings in bottom of tank for tank fitting; tappings in end of tank for gauge glass. Provide ¾" full length gauge glass, with gauge cocks and cleanouts.
- 2.5.1 Tank Fittings: Provide tank fittings for compression tanks as indicated, sized for compression tank diameter. Design tank fittings for 125 psi pressure rating and include manual vent to establish proper air volume in tank on initial fill.
- 2.5.2 Acceptable Manufacturers: Subject to compliance with requirements, provide compression tanks and tank fittings of one of the following:
- Amtrol, Inc.
 - Bell & Gossett
 - Taco, Inc.
 - Wheatley

2.6 Diaphragm-Type Compression Tanks: Provide diaphragm compression tanks of size and number as indicated. Construct tank of welded steel, constructed, tested, and stamped in accordance with Section VIII of ASME Boiler and Pressure Vessel Code for a working pressure of 125 psi. Furnish National Board Form U-1 denoting compliance. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles. Provide specially compounded flexible diaphragm securely sealed into tank to permanently separate air charge from system water, to maintain design expansion capacity. Provide pressure gauge and air-charging fitting, and drain fitting.

2.6.1 Acceptable Manufacturers: Subject to compliance with requirements, provide diaphragm-type compression tanks of one of the following:

Amtrol, Inc.
Bell & Gossett
Taco, Inc.
Wheatley

2.7 Shot Feeders: Provide shot feeders of 5 gallon capacity or otherwise as indicated, construction of cast iron or steel, for introducing chemicals in hydronic system. Provide funnel and valve on top for loading, drain valve in bottom, and recirculating valves on side. Construct for pressure rating of 125 psi.

2.8 Liquid Flow Switches: Provide liquid flow switches as indicated to sense flow and non-flow. Construct of brass for all wetted parts, provide packless construction. Provide paddle with removable segments for pipe size and flow velocity. Provide vapor proof electrical compartment for switches mounted on cold hydronic piping systems. Coordinate switch electrical requirements with chiller and HVAC control requirements. McDonald & Miller or equal.

2.9 Water Relief Valves: Provide water relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.

2.9.1 Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 Listing Requirements for temperature discharge capacity. Provide temperature relief at 210°F and pressure relief at 125 psi.

2.9.2 Pressure Relief Valves: Provide ASME pressure relief valves, bronze or iron body as required with test. The set point shall be at or below the maximum allowable working pressure of the most limiting device in the system being protected. Valves shall have enclosed spindles with gland seals to minimize leakage. Coordinate pressure relief setting to protect all equipment.

2.9.3 Acceptable Manufacturers: Subject to compliance with requirements, provide water relief valves of one of the following:

Amtrol, Inc.
Bell & Gossett
Watts Regulator Co.
McDonald & Miller
Kunkle

Manning, Maxwell & Moore
Wheatley

- 2.10 Pressure Reducing Valves: Provide pressure reducing valves as indicated, of size and capacity as selected by Installer to maintain operating pressure on boiler system.
- 2.10.1 Construction: Cast iron or brass body, low inlet pressure check valve, inlet strainer removable without system shut-down, noncorrosive valve seat and stem, factory set at operating pressure.
- 2.10.2 Acceptable Manufacturers: Subject to compliance with requirements, provide pressure reducing valves of one of the following:
- Amtrol, Inc.
Bell & Gossett
Taco, Inc.
Watts Regulator Co.
Wheatley
- 2.11 Pump Discharge Valves: Provide triple duty pump discharge valves as indicated. Provide non-slam check valve with spring-loaded disc and calibrated adjustment feature permitting regulation of pump discharge flow and shutoff. Design valves to permit repacking under full line pressure, and with bolt-on bonnet. Provide flanged cast-iron valve body, pressure rated for 175 psi, maximum operating temperature of 300°F. Provide straight or angle pattern as indicated.
- 2.11.1 Acceptable Manufacturers: Subject to compliance with requirements, provide pump discharge valves of one of the following:
- Amtrol, Inc.
Bell & Gossett
Taco, Inc.
Wheatley
- 2.12 Pump Suction Diffusers: Provide pump suction diffusers as indicated. Construct unit with angle pattern cast-iron body, threaded for 2" and smaller, flanged for 2½" and larger, pressure rated for 175 psi. Provide inlet vanes with length 2½ times pump suction diameter or greater. Provide cylinder strainer with 3/16" diameter openings with total free area equal to or greater than 5 times cross-sectional area of pump suction, designed to withstand pressure differential equal to pump shutoff head. Provide disposable fine mesh strainer to fit over cylinder strainer. Provide permanent magnet located in flow stream, removable for cleaning. Provide adjustable foot support designed to carry weight of suction piping. Provide blowdown tapping in bottom, gauge tapping in side.
- 2.12.1 Acceptable Manufacturers: Subject to compliance with requirements, provide pump suction diffusers of one of the following:
- Amtrol, Inc.
Bell & Gossett
Taco, Inc.
Wheatley

2.13 Flow Control Valves: Provide flow control valves pressure rated for 125 psi, containing lift check assembly which will automatically open by means of pump flow pressure, and automatically close when pump is not operating. Provide with means to manually open in case of pump failure.

2.13.1 Threaded Ends 2" and Smaller: Cast-iron body, bronze check mechanism, screw-in bonnet, straight or angle pattern.

2.13.2 Soldered Ends 1¼" and Smaller: Cast-bronze body, bronze check mechanism, screw-in bonnet, straight or angle pattern.

2.13.3 Threaded and/or Flanged Ends 2½" through 4": Cast-iron body, bronze check mechanism, screw-in bonnet, straight or angle pattern.

2.13.4 Acceptable Manufacturers: Subject to compliance with requirements, provide flow control valves of one of the following:

Bell & Gossett.
Taco, Inc.

2.14 Differential Pressure Relief Valve: Provide adjustable globe pattern, differential pressure relief valve with check feature. The valve shall be hydraulically operated, pilot controlled, diaphragm type valve which maintains a constant pressure differential between two points. Claval Model 251G-01, or approved equal.

2.15 Hydronic Bridges: Provide packaged hydronic bridge units of size and capacity indicated. Units shall be of stand-alone design and be capable of return water supply water temperature control and of maintaining pressure differential across the bridge. The control valves in the units shall be the butterfly type. Temperature controllers shall have manual control or remote pneumatic reset input as indicated on the drawings. A flow sensor shall be installed between the supply and return pipes across the temperature control valve. Provide an air pressure regulator and filter unit for the control air line. Provide two temperature transmitter wells and one temperature transmitter.

2.15.1 Acceptable Manufacturers: Subject to compliance with requirements. Provide hydronic bridges by one of the following:

BRDG-TNDR Corporation
Bell & Gossett

3 EXECUTION

3.1 General: Examine areas and conditions under which hydronic specialties are to be installed. Do not proceed with work until satisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Balance Cocks: Install balance cocks on outlet of each hydronic terminal, on end of each hydronic zone circuit, on discharge of each hydronic pump, and elsewhere as indicated. After

- hydronic system balancing has been completed, mark each balance cock with stripe of yellow lacquer across body and stem to permanently mark final balance position.
- 3.3 Vent Valves:
- 3.3.1 Manual Vent Valves: Install manual vent valves on each hydronic terminal at highest point, and on each hydronic piping drop in direction of flow for mains, branches, and runouts, and elsewhere as indicated.
- 3.3.2 Automatic Vent Valves: Install automatic vent valves at top of each hydronic riser and elsewhere as indicated. Install shut-off valve between riser and vent valve, pipe outlet to suitable plumbing drain, or as indicated.
- 3.4 Air Separators:
- 3.4.1 Dip Tube Fittings: Install dip tube fittings in boiler outlet in accordance with manufacturer's instructions. Run piping to compression tank with ¼" per foot (2%) upward slope towards tank. Connect boiler outlet piping.
- 3.4.2 In-Line Air Separators: Install in-line air separators in pump suction lines. Connect inlet and outlet piping. Run piping to compression tank with ¼" per foot (2%) upward slope towards tank. Install drain valve on units 2" and over.
- 3.5 Compression Tanks: Install compression tanks on trapeze hangers sized for tank fully loaded, or otherwise as indicated. Install gauge glass and cocks on end of tank. Install tank fitting in tank bottom and charge tank in accordance with manufacturer's instructions. Install tank fittings in bottom of compression tanks. Use manual vent for initial fill to establish proper water level in tank. Provide drain valve and hose of sufficient length to discharge to floor drain.
- 3.6 Diaphragm-Type Compression Tanks: Install diaphragm-type compression tanks on floor as indicated, in accordance with manufacturer's instructions. Vent and purge air from hydronic system, charge tank with proper air charge as recommended by manufacturer.
- 3.7 Shot Feeders: Install shot feeders on each hydronic system at pump discharge and elsewhere as indicated. Install in upright position with top of funnel not more than 48" above floor. Install globe valve in pump discharge line between recirculating lines. Pipe drain to nearest plumbing drain or as indicated.
- 3.8 Liquid Flow Switches: Install liquid flow switches on inlet to water chiller inlet to water condenser and elsewhere as indicated. Install in horizontal pipe with switch mounted in tee on top of pipe with minimum of 24" of straight pipe with no fittings both upstream and downstream of switch. Remove segments of paddle to fit pipe in accordance with manufacturer's instructions.
- 3.9 Water Relief Valves: Install where indicated on the drawings. Pipe discharge to drain. Rigidly support discharge piping and route in the most direct manner possible. Turn down relief piping so as not to injure personnel. Comply with ASME Boiler and Pressure Vessel Code.

- 3.9.1 Pipe discharge from relief valve full size, sloping downward to a floor drain or outside the building. Cut the end of the pipe at a 45° angle and terminate the pipe six inches above the floor or grade.
- 3.10 Pressure Reducing Valves: Install for each piece of hydronic equipment requiring makeup water in accordance with manufacturer's installation instructions.
- 3.11 Pump Discharge Valves: Install pump discharge valves on each pump discharge line in lieu of separate shutoff valve, check valve, and balance cock. Install in horizontal or vertical position with stem in upward position; allow clearance above stem for check mechanism removal. After hydronic system has been completed, mark calibrated name plate with stripe of yellow lacquer to permanently mark final balanced position.
- 3.12 Pump Suction Diffusers: Install pump suction diffusers on each pump suction line in lieu of separate strainer, reducing elbow, entrance pipe, and pressure gauge outlet. Install on pump suction inlet, adjust foot support to carry weight of suction piping. Install nipple and shutoff valve in blowdown connection. After cleaning and flushing hydronic piping system, but before balancing of hydronic piping system, remove disposable fine mesh strainer.
- 3.13 Differential Pressure Relief Valves: Install where shown on the drawings and set to prevent chilled water pumps from operating at shutoff head. Final setting shall be determined after test and balance work is complete.
- 3.14 Hydronic Bridges: Install hydronic bridges where shown on drawings in compliance with manufacturer's recommendations. Mount controllers within 4 feet of the bridge. All pneumatic piping shall be ¼" copper. Coordinate installation of remote reset signals with controls contractor. Install temperature transmitter wells where indicated on the drawings. The services of a factory technician shall be provided to direct the installation, start-up, and final performance verification.
- 3.15 Hydronic Bridge Control: Hydronic bridges shall have stand-alone control capability controls tied into the EMCS. The controls shall include bridge temperature and pressure differential. Bridge temperature controllers shall accept a pneumatic reset DDC reset signal where indicated.

END OF SECTION 23 21 16

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 23 31 13 - HVAC METAL DUCTWORK

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-23 Basic Mechanical Materials and Methods Sections apply to work of this section.
- 1.3 Extent of HVAC metal ductwork is indicated on drawings and in schedules, and by requirements of this section.
- 1.4 Refer to other Division-23 sections for exterior insulation of metal ductwork.
- 1.5 Refer to other Division-23 sections for ductwork accessories.
- 1.6 Codes and Standards:
- 1.6.1 SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" 1985 Edition for fabrication and installation of metal ductwork, unless otherwise noted.
- 1.6.2 NFPA 90A Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".
- 1.7 Approval Submittals:
- 1.7.1 Product Data: Submit manufacturer's technical product data and installation instructions for the following.
- Factory-fabricated ductwork
 - Sealants
 - Flexible duct
 - Spin-in fittings
 - Side take-off fittings
 - Fabric Ductwork
 - Duct liner
 - Adhesive
- 1.7.2 Shop Drawings: Submit scaled layout drawings of HVAC metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between ductwork and proximate equipment. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced.

2 PRODUCTS

2.1 Ductwork Materials:

2.1.1 Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.

2.1.2 Galvanized Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lockforming quality; with G 90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed locations. Stamp gauge and manufacturer's identification on each sheet. Break sheets so that identification is exposed.

2.2 Miscellaneous Ductwork Materials:

2.2.1 General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

2.2.2 Duct Liner: Fibrous glass, 1½ pcf minimum density, complying with Thermal Insulation Manufacturers Association (TIMA) AHC-101; of thickness indicated. Certaineed "Coated Ultralite", Owens Corning "Aeroflex", PPG "Textrafine", or Manville "Linacoustic".

2.2.3 Duct Liner Adhesive: Comply with ASTM C 916 "Specifications for Adhesives for Duct Thermal Insulation".

2.2.4 Duct Liner Fasteners: Comply with SMACNA HVAC Duct Construction Standards, Article S2.11.

2.2.5 Duct Sealant: Provide non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

2.2.6 Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork. For exposed stainless steel ductwork, provide matching stainless steel support materials.

2.2.7 Flexible Ducts: Provide flexible ductwork with an R-value of R-6 unless the ductwork is in a ceiling return plenum. The use of flexible ductwork for connection of supply air including terminal units and return air devices is acceptable only where shown on the drawings.

2.2.7.1 Construction: Provide reinforced metalized polyester jacket that is tear and puncture resistant, air tight inner core with no fiberglass erosion in the air stream and an encapsulated wire helix. Flexible ductwork shall have a recommended operating pressure of 6" w.g. for sizes 4" through 12" diameter and 4" w.g. for sizes 14" through 20" diameter. All diameters shall be suitable for a negative operating pressure of 0.75" w.g. Flexible ductwork shall meet the requirements of UL-181, the Florida Energy Code, Florida Building Code, NFPA 90A and NFPA 90B.

2.2.7.2 Acceptable Manufacturers: Subject to compliance with requirements, provide R-6 flexible ductwork by: Atco 36, Flexmaster 8M-R6 or Thermaflex M-KE R6.

- 2.2.8 Spin-in and Side Take-off Fittings: Provide round branch run-outs as follows.
- 2.2.8.1 Spin in air device connections shall be straight sided spin in with damper and two inch high insulation stand-off equal to Crown 3720-DS.
- 2.2.8.2 Where duct height does not permit the use of spin-in fittings, use low profile side take-off fittings equal to Crown 3300-DS or Flexmaster STOD-BO.
- 2.2.9 Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15° change of direction per section. Unless specifically detailed otherwise, use 45° laterals and 45° elbows for branch takeoff connections. Where 90° branches are indicated, provide conical type tees.
- 2.3 Fabrication:
- 2.3.1 Shop fabricate ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.
- 2.3.2 Shop fabricate ductwork of gauges and reinforcement complying with SMACNA "HVAC Duct Construction Standards", except provide sealant at all joints. Supply duct from low pressure air conditioning units, and all return and exhaust duct shall be minimum 2" pressure class unless otherwise noted.
- 2.3.3 Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1½ times associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.
- 2.3.4 Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division-23 section "Ductwork Accessories" for accessory requirements.
- 2.3.5 Fabricate ductwork with duct liner in each section of duct where indicated. Laminate liner to internal surfaces of duct (100% coverage) in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners (Grip Nails or Stic Klips) on 16 centers. On horizontal runs install top and bottom first and wedge sides between top and bottom. Apply a brush coat of fire retardant over all joints, visible cut edges, and leading edges to prevent erosion.
- 2.4 Factory-Fabricated Low Pressure Ductwork (Maximum 2" W.G.):
- 2.4.1 Material: Galvanized sheet steel complying with ASTM A 527, lockforming quality, with ASTM A 525, G90 zinc coating, mill phosphatized.
- 2.4.2 Gauge: 28-gauge minimum for round ducts and fittings, 4" through 8" diameter. 26-gauge minimum 9" through 14", 24-gauge minimum 15" through 26".
- 2.4.3 Elbows: One piece construction for 90° and 45° elbows 14" and smaller. Provide multiple

gore construction for larger diameters with standing seam circumferential joint.

- 2.4.4 Divided Flow Fittings: 90° tees, constructed with saddle tap spot welded and bonded to duct fitting body.
- 2.4.5 Acceptable Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork by Semco Mfg., Inc. or United Sheet Metal Div., United McGill Corp, or approved equal.

3 EXECUTION

3.1 General: Examine areas and conditions under which HVAC metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Installation of Metal Ductwork:

3.2.1 General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

3.2.2 Supports: Install concrete inserts for support of ductwork in coordination with formwork, as required to avoid delays in work. Install self-drilling screw anchors in prestressed concrete or existing work.

3.2.3 Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements. Seal joints in round or oval ductwork with hard cast or shrink bands, and sheet metal screws, or by welding. High velocity rectangular ducts shall have approved joints and be made airtight with sealer or welding.

3.2.4 Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally. Avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. In finished and occupied spaces, conceal ductwork from view by locating in mechanical shafts, hollow wall construction or above suspended ceilings, unless specifically noted as "Exposed". Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

3.2.5 Internally Lined Ductwork: Cover leading and trailing edge of duct liner with sheet metal nosing zee.

3.2.6 Electrical Equipment Spaces: Do not route ductwork through transformer vaults or other

electrical equipment spaces and enclosures.

- 3.2.7 Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1½". Fasten to duct and substrate. Where ducts pass through fire-rated floors, walls, or partitions, provide firestopping between duct and substrate.
- 3.2.8 Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
- 3.2.9 Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards. Fan discharge outlet ducts shall be installed correctly with regard to "system effect" per AMCA Publication 201.
- 3.3 Installation of Flexible Ducts:
 - 3.3.1 Maximum Length: For any duct run using flexible ductwork, do not exceed 5'-0" extended length. Flexible duct shall only be allowed as detailed on the drawings.
 - 3.3.2 Installation: Install in accordance with Section III of SMACNA's "HVAC Duct Construction Standards, Metal and Flexible". Support flexible ducts to eliminate pinching and kinking which would restrict flow.
 - 3.3.3 Low Pressure Systems: Peel back insulation and slide the inner core over the spin-in or diffuser neck, seal with duct sealant and install Panduit strap tightly. Slide insulation back over the inner core and install another Panduit strap over the insulation outer jacket. Tape is not acceptable.
 - 3.3.4 Seal all exposed edges of fiberglass insulation with glassfab and mastic.
- 3.4 Leakage Tests: After each duct system is completed, test for duct leakage in accordance with Sections 3 and 5 of the SMACNA HVAC Air Duct Leakage Test Manual. Test pressure shall be equal to pressure class of duct, less 0.5" static pressure. Repair leaks and repeat tests until total leakage is less than 5% of system design air flow for low pressure systems and less than 1% for systems rated over 3".
- 3.5 Equipment Connections: Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.
- 3.6 Clean ductwork internally free of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration. Keep ducts closed with poly during construction to prevent contamination by construction dust and debris.
- 3.7 Installation of Insulation on Exterior Ducts:
 - 3.7.1 Install 3" thick rigid insulation. Provide weatherproof finish.

- 3.7.2 Pitch the upper surface of the duct insulation to drain by installing a 6" wide insulation board (or equal) down the center of the duct prior to applying the insulation.
- 3.7.3 Clean and dry ductwork prior to insulating. Butt insulation firmly together to ensure complete and tight fit over surfaces to be covered. Install insulation materials with smooth and even surfaces. Maintain integrity of aluminum vapor barrier wherever possible. Extend insulation without interruption through walls, floors and similar ductwork penetrations except where otherwise indicated.
- 3.7.4 Install with facing to the outside with a maximum of 25% compression. Butt all insulation joints firmly together. Longitudinal seam of the vapor retarder must be overlapped a minimum of 2". Staples shall be outward clinch and placed approximately 6" on center. All penetrations, joints, seams, and damage to the facing shall be sealed with glass fabric and mastic prior to system startup. For rectangular ducts over 24" wide, secure the insulation to the bottom of the duct with mechanical fasteners spaced on 12" centers to reduce sag. Do not overcompress the insulation with the retainer. Larger ducts shall be secured with fasteners on 12-inch centers and 3 inches from all edges.
- 3.7.5 Apply open mesh glass fabric embedded in vapor barrier mastic. Then apply a second coat of general purpose mastic with aluminum grey color.
- 3.7.6 Provide a smooth 0.016" aluminum jacket with seams positioned to shed water.
- 3.8 Balancing: Refer to Division-23 section "Testing, Adjusting, and Balancing" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.
- 3.9 System Adjustment: Adjust the system to provide functional operation to the extent possible, and leave ready for Testing and Balancing work. It is not the intent of this section to provide final testing and balancing, but to leave the system operational with a minimum of noise.

END OF SECTION 23 31 13

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SECTION 23 33 00 - DUCTWORK ACCESSORIES

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.

1.4 Refer to other Division-23 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

1.5 Codes and Standards:

1.5.1 SMACNA Compliance: Comply with applicable portions of both SMACNA "HVAC Duct Construction Standards, Metal and Flexible" and "Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems".

1.5.2 UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers". Construct, test and label smoke dampers in accordance with UL Standard 555S "Leakage Rated Dampers for use in Smoke Control Systems".

1.5.3 NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems" pertaining to installation of ductwork accessories.

1.6 Approval Submittals:

1.6.1 Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions as follows:

Low pressure manual dampers
Control dampers
Flexible connections

1.6.2 O&M Data Submittals: Submit manufacturer's maintenance data including parts lists for dampers. Include this data, product data, and a copy of approval submittals in O&M manual.

2 PRODUCTS

2.1 Dampers:

2.1.1 Low Pressure Manual Dampers: Provide 16 gauge dampers of single-blade type (12"

maximum blade width) or multiblade type. Damper blades to be gang-operated from a single shaft with nylon or ball bearings on each end. Provide indexed locking quadrant. Parallel or opposed blade style is acceptable. Provide 2" standoff on locking quadrant for externally insulated duct.

- 2.1.2 Control Dampers: Extruded aluminum (6063-T5) damper frame shall not be less than 0.080" in thickness. Damper frame shall be 4" deep x 1", with duct mounting flanges on both sides of frame. Damper frame shall have a 2" mounting flange on the rear of the damper when installed as Extended Rear Flange install type. Aluminum frame shall be clear anodized to a minimum thickness of 0.7 mil deep. Frame shall be assembled using stainless steel screws. Welded frames shall not be acceptable. Actuators (motors) are provided by control contractor.
- 2.1.2.1 Blades shall be maximum 6.4" deep extruded aluminum (6063-T5) air-foil profiles with a minimum wall thickness of 0.06", clear anodized to a minimum thickness of 0.7 mil deep.
- 2.1.2.2 Blade seals shall be extruded silicone, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.
- 2.1.2.3 Hexagonal control shaft shall be $\frac{7}{16}$ ". It shall have an adjustable length and shall be an integral part of the blade axle. A field-applied control shaft shall not be acceptable. All parts shall be stainless steel.
- 2.1.2.4 Linkage hardware shall be aluminum and stainless steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with stainless steel cup-point trunnion screws to prevent linkage slippage. Linkage that consists of metal rubbing metal will not be approved.
- 2.1.2.5 Dampers shall be designed for operation in temperatures ranging from -40°F to 212°F.
- 2.1.2.6 Dampers shall be AMCA rated for Leakage Class 1A at 1 in w.g. static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.
- 2.1.2.7 Dampers shall be custom made to required size, with blade stops not exceeding 1¼" in height.
- 2.1.2.8 Dampers shall be opposed blade for modulating dampers or parallel blade action for open/shut dampers.
- 2.1.2.9 Dampers shall be installed in the following manner: Installed in Duct
- 2.1.2.10 Installation of dampers must be in accordance with manufacturer's current installation guidelines, provided with each damper shipment.
- 2.1.2.11 Field supplied intermediate structural support is required to resist applied pressure loads for dampers that consist of two or more sections in both height and width.
- 2.1.2.12 Acceptable Manufacturers: Subject to compliance with requirements, provide access doors by TAMCO (T.A. Morrison & Co, Inc), Pottorff, Ruskin, or approved equal.
- 2.2 Turning Vanes: Provide manufactured or fabricated single wall turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

2.3 Flexible Connections:

2.3.1 General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

2.3.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following: Duro Dyne Corp., Flexaust (The) Co., or Ventfabrics, Inc.

3 EXECUTION

3.1 Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Installation of Ductwork Accessories:

3.2.1 Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

3.2.2 Install balancing dampers at all main ducts adjacent to units in return air, outside air and where indicated.

3.2.3 Install control dampers in the outside air duct and return air duct for each air handler. Damper operator provided by control contractor.

3.2.4 Install turning vanes in square or rectangular 90° elbows in supply, return, and exhaust air systems, and elsewhere as indicated.

3.2.5 Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter. Install on entering air side of reheat coils. Install at fire dampers and smoke dampers. Opening size shall be per NFPA 90A for servicing fire and smoke dampers. Provide label with 1-1/2" letters to indicate location of fire protection devices—FIRE DAMPER ACCESS or SMOKE DAMPER ACCESS.

3.2.6 Install flexible connections in ductwork such that the clear length of the connector is approximately two inches. Provide thrust restraints as required. Flexible material shall not be so slack as to take a definite concave or convex shape during fan operation.

3.2.7 Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.3 Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories as required to obtain proper operation and leakproof performance.

3.4 Adjusting and Cleaning:

- 3.4.1 Adjusting: Adjust ductwork accessories for proper settings.
- 3.4.2 Final positioning of manual dampers is specified in Division-23 section "Testing, Adjusting, and Balancing". However, the system shall be left functional with all dampers open or throttled.
- 3.4.3 Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 233300

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SECTION 23 34 00 - FANS

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of fan work required by this section as indicated on drawings and schedules, and by requirements of this section.

1.4 Coordination:

1.4.1 Refer to Division-7 sections for installation of prefabricated roof curbs; not work of this section. Furnishing prefabricated roof curbs is part of this section's work.

1.4.2 Refer to Division-23 section "Testing, Adjusting, and Balancing" for balancing of fans.

1.4.3 Refer to Division-23 HVAC control systems sections for control work required in conjunction with fans.

1.4.4 Refer to Division-26 sections for power supply wiring from power source to power connection on fans. Division-26 work will include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

1.5 Codes and Standards:

1.5.1 AMCA Compliance: Provide fans which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Ratings Seal.

1.5.2 UL Compliance: Provide fans which are listed by UL and have UL label affixed.

1.6 Approval Submittals:

1.6.1 Product Data: Submit manufacturer's technical data for fans, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions. Submit assembly-type drawings showing unit dimensions, construction details, methods of assembly of components, and field connection details.

Fans
Vibration Control

1.7 O&M Data Submittals: Submit maintenance data and parts list for each type of fan, accessory, and control. Include these data, a copy of approved submittals, and wiring diagrams in O&M Manual.

2 PRODUCTS

- 2.1 General: Except as otherwise indicated, provide standard prefabricated fans of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation. Provide accessories as listed in the schedule on the drawings and as described herein. Motors shall be high efficiency per Division-23 section "Motors".
- 2.2 Acceptable Manufacturers: Subject to compliance with requirements provide fans manufactured by Acme, Greenheck, Loren Cook, Penn or approved equal unless otherwise noted herein.
- 2.3 In-Line Centrifugal Fans:
- 2.3.1 Housing: Provide square weather tight housing constructed of aluminum or steel and painted inside and out with an epoxy finish. Provide venturi type inlet. Provide heavy duty duct collars. Housing and bearing supports shall be constructed of heavy gauge bolted and welded steel construction. Provide two sided access panels, located perpendicular to the motor mounting plane. Provide ½" insulated housing. Provide motor and drive cover for belt drive units.
- 2.3.2 Fan Wheels: Provide aluminum air foil type, backward curved, statically and dynamically balanced.
- 2.3.3 Drive: Provide direct or belt drive as scheduled with pre-lubricated, ball bearing, continuous duty type motors. Provide vibration isolation equipment for the entire drive.
- 2.3.4 Filter Housing: Where indicated, provide insulated filter housing with 2-inch thick disposable MERV 8 filters. Provide construction set, a clean set installed at substantial completion, and one spare set for the owner.
- 2.3.5 Isolation and Support: Provide spring type vibration isolators and fan support brackets.
- 2.4 Vibration Isolation: Mount fans on vibration isolators in accordance with the requirements of Division-23 section "Vibration Isolation" and the following list.
- 2.4.1 Hangers: Type HA2.
- 2.5 Centrifugal Ceiling Exhausters:
- 2.5.1 Fan Assembly: Provide steel housing, plastic or aluminum grille, backdraft damper, statically and dynamically balanced fan wheel, permanently lubricated motor with internal thermal overloads, vibration isolation and all required mounting hardware and brackets. Provide acoustically treated housing for all fans larger than 60 cfm. Mounting type shall be as indicated on the drawings or on the schedule.
- 2.5.2 Connectors: Provide adaptors, connectors, and eave elbows as required to connect fan discharges to outlets.
- 2.5.3 Outlets: Provide where shown on the drawings (or required by the installation) wall caps, vent caps, or roof jacks, each with birdscreen, to match fans and surrounding construction.

3 EXECUTION

- 3.1 General: Except as otherwise indicated or specified, install fans in accordance with manufacturer's installation instructions and recognized industry practices to insure that fans serve their intended function.
- 3.2 Coordinate fan work with work of roofing, walls, and ceilings as necessary for proper interfacing. Framing of openings, caulking, and curb installation is not work of this section.
- 3.3 Ductwork: Refer to Division-23 section "Ductwork". Connect ducts to fans in accordance with manufacturer's installation instructions. Provide flexible connections in ductwork at fans.
- 3.4 Install fans on vibration isolation equipment as required. Set level and plumb.
- 3.5 Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Verify proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- 3.6 Remove shipping bolts and temporary supports within fans. Adjust dampers for free operation.
- 3.7 Testing: After installation of fans has been completed, test each fan to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.
- 3.8 Cleaning: Clean factory-finished surfaces. Remove all tar and soil. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 23 34 00

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SECTION 23 37 13 - GRILLES, REGISTERS AND CEILING DIFFUSERS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.
- 1.4 Refer to other Division-23 sections for ductwork and duct accessories required in conjunction with air outlets and inlets and for balancing of air outlets and inlets; not work of this section.
- 1.5 Codes and Standards:
 - 1.5.1 ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 "Certification, Rating and Test Manual". Provide air outlets and inlets bearing ADC Certified Rating Seal.
 - 1.5.2 NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".
- 1.6 Approval Submittals:
 - 1.6.1 Product Data: Submit manufacturer's technical product data for air outlets and inlets indicating construction, finish, and mounting details.
 - 1.6.2 Performance Data: For each type of air outlet and inlet furnished, provide aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections and data as required.
- 1.7 O&M Data Submittals: Submit cleaning instructions for finishes and spare parts lists. Include this data and a copy of approval submittals in O&M manual.

2 PRODUCTS

- 2.1 General:
 - 2.1.1 Except as otherwise indicated, provide manufacturer's standard grilles, registers, and ceiling diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
 - 2.1.2 Manufacturers not listed in the following specification will not be considered for approval unless accepted by addendum prior to bid.

- 2.1.3 Performance: Provide grilles, registers and ceiling diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device equal to the basis of design.
- 2.1.4 Ceiling and Wall Compatibility: Provide grilles, registers and diffusers with border styles that are compatible with adjacent wall and ceiling systems, and that are specifically manufactured to fit into ceiling module or wall with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems and walls which will contain each type of ceiling diffuser, grille, or register.
- 2.1.5 Appearance: All grilles and registers shall be aluminum construction and all diffusers shall be steel or aluminum construction, unless otherwise noted, with uniform matching appearance for each type of outlet. Ceiling mounted grilles and registers shall be set to be sight tight from the predominant exposure.
- 2.1.6 Finish: All ceiling mounted grilles, registers, and diffusers shall be finished with manufacturer's standard color to be selected by the architect. Wall and door mounted grilles and registers shall be finished with clear anodized finish .
- 2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products by Titus, Price, Krueger, or Metal Aire.
- 2.3 Rectangular Ceiling Diffusers: Provide rectangular face, adjustable diffuser with removable inner core, no corner joints. If square or rectangular neck is provided, provide square to round adaptor as required. Provide lay-in panel as required. Provide beveled trim ring for diffusers in hard ceilings.
- 2.4 Return Grilles : Provide return grilles with one set of 45 degree fixed louvers, parallel to the long dimension. Provide mounting frame for all wall and plaster ceiling installations.

3 EXECUTION

- 3.1 Coordinate installation with ceiling and light fixture installation. Locate ceiling outlets as indicated on architectural Reflected Ceiling Plans. Unless otherwise indicated, locate ceiling outlets in the center of acoustical ceiling modules with sides parallel to the grid.
- 3.2 Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.
- 3.3 Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- 3.4 Set air volumes to values shown on the drawings so that the system is functional. Leave ready for test and balance contractor.
- 3.5 Furnish to Owner three operating keys for each type of outlet and inlet that require them; obtain receipt.

END OF SECTION 23 37 13

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SECTION 23 37 26 - WALL LOUVERS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Extent of wall louver work is indicated by drawings and schedules, and by the requirements of this section.
- 1.4 Refer to other Division-23 sections for ductwork, duct accessories and controls work.
- 1.5 AMCA Compliance: Test and rate louvers in accordance with AMCA Standard 500. Provide AMCA certified rating seal. Ratings based on tests and procedures performed in accordance with AMCA 500-L and complying with the AMCA 511 Certified Ratings Program. AMCA Certified Ratings Seal applies to air performance, water penetration and wind driven rain ratings.
- 1.6 Product Qualifications:
1. Miami-Dade County, Florida Notice Of Acceptance (NOA).
 2. Florida Building Code Approval.
 3. Louver shall be certified to Florida Building Code Testing Application Standards TAS 100(A) (Wind Driven Rain Resistance), TAS 201 (Large Missile Impact), TAS 202 (Uniform Static Air Pressure) and TAS 203 (Cyclic Wind Loading).
 4. AMCA Listed for compliance to AMCA 540 Level E and AMCA 550 standards.

1.7 Approval Submittals:

- 1.7.1 Product data: Submit manufacturer's technical product data for louvers including: model number, accessories furnished, construction, finish, mounting details, performance data.
- 1.8 O&M Data Submittals: Submit maintenance data, including cleaning of finishes and a copy of approval submittals. Include in O&M manual.

2 PRODUCTS

- 2.1 Acceptable Manufacturers: Subject to compliance with requirements, submit products by Ruskin, Greenheck, Arrow, American Warming and Ventilating, or AMCA labeled approved equal.
- 2.2 General: Except as otherwise indicated, provide manufacturer's standard louvers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation. Provide Kynar 500 coated, corrosion

resistant finish; color to be selected by the Owner.

- 2.3 Substrate Compatibility: Provide louvers with 6 inch frame, flange and sill extension piece that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.
- 2.4 Materials: Construct of aluminum extrusions, Alloy 6063-T6 0.095” thick for frame and 0.062” thick for blades. Weld units or use stainless steel fasteners.
- 2.5 Sill Flashing: Formed aluminum, 0.080” thick, upturned sides to prevent water leakage.
- 2.6 Installation Angles: Material: 1.50 x 1.50 inch x 0.250 inch thick continuous aluminum angles around louver perimeter for installation in concrete, deep CMU, steel and wood substrate wall systems.
- 2.7 Installation Plates: Material: 0.250 inch (6.4 mm) thick continuous aluminum flat or zee plates for installation in thin CMU substrate wall systems.
- 2.8 Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.
- 2.9 Stationary Louvers: Hurricane and impact rated louvers, basis of design is Ruskin EME6325D.
- 2.10 Performance Data:
1. Performance Ratings: AMCA licensed.
 - a. Based on testing 48 inches x 48 inches size unit in accordance with AMCA 500-L.
 2. Free Area: 42 percent, nominal.
 3. Free Area Size: 6.66 square feet.
 4. Maximum Recommended Air Flow through Free Area: 2,155 feet per minute.
 5. Air Flow: 10,431 cubic feet per minute.
 6. Maximum Pressure Drop (Intake): 0.60 inches w.g..
 7. Water Penetration: Beginning point of water penetration of 0.01 ounce per ft² of free area shall be above 1,250 feet per minute free area velocity.
 8. Wind Load Rating: Maximum wind load of ±150 PSF.
 9. AMCA 500-L Wind Driven Rain Performance: 99.9 percent effective at preventing water penetration through louver when tested at 50 miles per hour wind with 8 inches per hour rainfall and 2,155 feet per minute airflow through the free area. Penetration Class ‘A’ with Discharge Class (Intake) ‘3’ in accordance with AMCA 500-L Wind Driven Rain Test.

3 EXECUTION

- 3.1 Install where shown on the drawings in accordance with the manufacturer's printed instruction and Florida Product Approval. Exercise care to prevent scratches.
- 3.2 Isolate dissimilar metals per the manufacturer’s recommendations.

- 3.3 Verify size of louvers shown on drawings prior to fabrication. Coordinate with wall openings. Sizes may be altered subject to approval by Engineer provided free area remains approximately the same as indicated.

END OF SECTION 23 37 26

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SECTION 23 73 23 - CUSTOM AIR HANDLING UNITS

1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Extent of air handling unit work is indicated on drawings, and schedules, and by requirements of this section.
- 1.4 Refer to other Division-23 sections for field-applied insulation to air handling units.
- 1.5 Refer to other Division-23 sections for condensate, hot and chilled water piping required in conjunction with air handling units.
- 1.6 Refer to other Division-23 Sections for HVAC equipment to be included as part of the penthouse units or air handling units such as DDC Controls, Variable Frequency Drives, and Hydronic Specialties.
- 1.7 Refer to Division-26 sections for the following work; not work of this section.
 - 1.7.1 Power supply wiring from power source to power connection on unit. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory installed by manufacturer.
- 1.8 Codes and Standards:
 - 1.8.1 AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.
 - 1.8.2 ARI Compliance: Test and rate air handling units in accordance with ARI 430 "Standard for Central-Station Air Handling Units", and ARI 410 for coils, display certification symbol on units of certified models.
 - 1.8.3 NFPA Compliance: Provide air handling unit internal insulation, adhesives, and coatings having flame spread rating not over 25 and smoke developed rating no higher than 50; and complying with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems."
 - 1.8.4 UL and NEMA Compliance: Provide electrical components required as part of air handling units, which have been listed and labeled by UL and comply with NEMA Standards.
 - 1.8.5 NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of air handling units.

1.9 Approval Submittals:

- 1.9.1 Product Data: Submit manufacturer's technical product data as follows showing dimensions, weights, capacities, certified ratings, fan performance with operating point clearly indicated, motor electrical characteristics, gauges and finishes of materials, and installation instructions. Submit assembly-type drawings showing unit dimensions, weight loadings, required clearances, construction details, and field connection details.

Air handling unit components including casings, fans, coils and all related equipment.
Vibration Isolation

- 1.9.2 Shop Drawings: Submit shop drawings showing the actual installation of each air handling unit, in plan and section. Show coil access, filter access, motor access, controls access and access to any other components requiring service. Show coordination with all related structural components of the building and show all unit supports. Show relationship to drains and other equipment. Show every electrical device and control panel with code-required service clearance clearly marked.

Units mounted in mechanical rooms.

1.10 O&M Data Submittals:

- 1.10.1 Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to air handling units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field installed.

- 1.10.2 Maintenance Data: Submit a copy of approval submittals. Submit maintenance instructions, including instructions for lubrication, filter replacement, motor and drive replacement, and spare parts lists. Include these data and wiring diagrams in O&M manuals.

2 PRODUCTS

- 2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide air handling units of one of the following:

McQuay Vision
Thermal
Trane CSAA

2.2 General:

- 2.2.1 Factory fabricated air handling units shall be constructed of solid steel, formed outer panels secured to an integral steel frame or to a bolted steel frame. Outer panels shall be removable without affecting the structural integrity of the units. All units shall come complete with a structural steel base around the entire perimeter. Construction shall result in a leakage rate of less than 1% of rated flow at maximum operating pressure.

- 2.2.2 Multiple sectioned units shall be as a single factory assembled piece (except where shipping limitations prevent) demounted into modular sections in the field by Contractor. Units shall be furnished with sufficient gasket and bolts for reassembly in the field by Contractor.

- 2.2.3 All units shall be UL or ETL listed.
- 2.2.4 All coil connections, access doors and drains shall be coordinated with field piping and electrical connections.
- 2.2.5 Unit exterior dimensions shall be the size as shown on the drawings.
- 2.3 Testing:
- 2.3.1 The unit manufacturer shall provide a factory leak test on all units at 8 inches static pressure. Cabinet leakage shall not exceed leak class 6 per ASHRAE 111 at 8 inches w.g. Specified air leakage shall be obtained without the use of caulk at normally removed access panels. Total estimated air leakage shall be reported for each unit in CFM, as a percentage of supply air, and as an ASHRAE 111 Leakage Class.
- 2.3.2 Fan shall be factory balanced to limit vibration at operating speed to the values shown in the following table. Measure vibration in all three planes. AHU manufacturer shall provide vibration test results.
- 2.4 Unit Base / Framework::
- 2.4.1 Unit base frame shall be structural steel cross members. The base shall include “Double Bottom” insulate floor. Base frames shall be fitted with lifting lugs at the corners of the unit or section (if demounted). Floor panels shall be double-wall construction and designed to support a 250 lb load during maintenance activities and shall deflect no more than 0.0042” per inch of panel span (L/240).
- 2.5 Exterior Casing:
- 2.5.1 The air handling unit casing shall be 2” thick double wall construction of the “no-through-metal” design. The casing structure shall incorporate insulating thermal breaks as required so that, when fully assembled, there exists no path of continuous unbroken metal to metal conduction from inner to outer surfaces. Provide required structural frame and casing to withstand 8" static pressure. Panels shall be gasketed and secured to the frame with screws. Outer panels shall be constructed from G-90 galvanized steel. The exterior panels shall be coated with a painting system designed for long term corrosion. Exterior mounted units shall incorporate a sloped roof at no less than 0.125” per foot with standing seams between sections.
- The paint shall meet or exceed the following criteria:
- (ASTM B-117) salt spray resistance 5% fog at 95 degrees F. Passes 500 hr.
- 2.6 Unit Casing Insulation: Insulation shall not be disturbed if panels are removed. Insulation shall be secured to the entire panel with mechanical and adhesive over the entire panel surface. Entire unit to be insulated with 2" thick insulation. The insulation shall have an effective thermal the resistance value of R13, minimum. Insulation shall fill panels and external structural frame members completely in all direction such that no voids exist. Panel insulation shall comply with NFPA 90A.
- 2.7 Linens: The units shall be double wall construction and include a solid galvanized liner (unless otherwise noted) in the entire unit.
- 2.8 Condensate Pan: Condensate drain pan shall be 16 gauge Type 304 stainless steel. All pans shall be insulated “Double Bottom” construction with welded corners. The drain shall be

sloped in two planes for complete drainage with no standing water in the unit. Drain connections shall be standard 1/4" NPT connection. Drain pans shall be provided under all cooling unit sections.

- 2.9 Access Doors: The unit shall be equipped with 2" double wall insulated, hinged access doors of the same construction as the interior and exterior wall panels. Doors shall be located upstream and downstream of all coils and in all filter, access plenum and fan sections and access to major components. The fan section door shall be large enough to allow the removal of the fan wheel and motor without disassembly of the unit casing. The door frame shall incorporate a built in thermal break barrier along with a gasket around the entire perimeter of the door. The door shall be hinged using a minimum of three heavy duty butt hinges. There shall be two heavy duty Ventlok (260/310) handles (or equal) per door. Provide an ETL, UL 1995, and CAL-OSHA approved tool operated safety latch on all fan section access doors. Operating tool shall be chained to each unit with tamper resistant fasteners within reach of the safety latch. All doors to have windows where shown. All doors to be 60" high when sufficient unit height is available, or maximum height allowed by the unit height.
- 2.10 Fans: Provide direct drive fans of type and class as specified on the schedule. Fan shafts shall be solid steel, coated with a rust-inhibiting coating, and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. All fans shall be statically and dynamically tested by the manufacturer for vibration and alignment as an assembly at the operating RPM to meet design specifications. Fans shall be statically and dynamically tested for vibration and alignment at speeds between 25% and 100% of design RPM. If fans are not factory-tested for vibration and alignment, the contractor shall be responsible for cost and labor associated with field balancing and certified vibration performance. Fan wheels shall be keyed to fan shafts to prevent slipping.
- 2.11 Motors: Provide high efficiency electrically commutated motors (ECM) with 0-10v input for use by the DDC system for speed control.
- 2.12 Coils:
- 2.12.1 Coil sections shall be double wall with 304 stainless steel inner liner.
- 2.12.2 All coil assemblies shall be tested under water at 315 psig and performance shall be certified under ARI Standard 410. Coils exceeding the range of ARI standard rating conditions shall be as noted on a coil computer printout.
- 2.12.3 Type WC (water coils) shall be constructed of seamless copper tubing mechanically expanded into fin collars. Fins shall be the die formed plate type. Headers shall be seamless copper with die formed tube holes. Connections shall be male pipe thread (MPT) Schedule 40 red brass.
- Vents and drains (1/8)" shall be provided for complete coil drainage. Coils shall be suitable for 250 psig working pressure. Intermediate tube supports shall be supplied on coils over 44" fin length with an additional support every 42" multiple thereafter. Coils shall have 5/8" o.d. x .035" wall copper tubes, .010" aluminum fins and 16 gauge Type 304 stainless steel casing. Coil tracks and supports shall be fabricated of Type stainless steel.
- 2.12.4 Provide multiple sections of coils split vertically and horizontally as required for coil removal. Safe off all spaces between coils to prevent air from bypassing coils.
- 2.12.5 Provide intermediate stainless steel drain pans beneath each section of cooling coil above bottom section. Provide a drain tube from each intermediate pan down to the base drain pan. Intermediate drain pans shall extend a minimum of 8" past the downstream face of coil.

- 2.12.6 Insulate all piping within the AHU in accordance with Division-23 section "Insulation for HVAC Equipment and Piping". Repair all cracks in insulation or covering at site after unit has been set. Piping and hydronic devices as well as piping insulation for all units shall be completed in the field.
- 2.13 Filter Boxes: Provide boxes to accommodate filters of the type indicated on the schedule. Factory fabricated filter sections shall be of the same construction and finish as the units. Side service filter sections shall include hinged access doors. Internal safing shall be provided by the manufacturer as required to prevent air bypass around the filters.
- 2.13.1 Filter Gauge: Each filter bank shall be furnished with one (1) Magnehelic filter gauge (Dwyer Series 2000).
- 2.14 Ducted connection: Provide ductwork connection of sizes shown on the drawings.
- 2.15 Lighting: Provide vapor-proof light fixtures in all accessible sections. Factory mounted and wired to an external service switch.
- 2.16 Electric Heaters: Provide electric heating coil with automatic reset thermal cutouts for primary over temperature protection and with load carrying manual reset thermal cutouts, factory-wired in series with SCR control, for secondary protection. Include overcurrent cutouts and sub-circuit fusing in assembly. Provide 0-10V input for use by the Digital Controls System for capacity control. Construct coils with resistance wire of 80% nickel/20% chromium, mounted in copper plated steel tube and surrounded by compacted magnesium-oxide powder. Provide spiral-wound copper plated steel fins continuously brazed to tubes.
- 2.17 Drains: Provide a capped washdown drain in each coil section.
- 2.18 Vibration Isolation: Provide Type EM5 Vibration Isolation.
- 3 EXECUTION
- 3.1 Examine areas and conditions under which air handling units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- 3.2 General: Install air handling units where indicated, in accordance with equipment manufacturer's published installation instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes. The work of this section includes all equipment necessary for a complete, packaged system, including work and equipment specified in other Division-23 sections.
- 3.3 Coordination: Coordinate with other work, including architectural panels, ductwork, floor construction and piping, as necessary to interface installation of air handling units with other work.
- 3.4 Access: Provide access space around air handling units for service as indicated, but in no case less than that recommended by manufacturer.
- 3.5 Support:
- 3.5.1 Install floor-mounted air handling units on reinforced concrete housekeeping pads of sufficient height to properly trap condensate, but in no case less than 4".

- 3.6 Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- 3.7 Piping Connections: Refer to Division-23 HVAC sections. Provide piping, valves, accessories, gauges and supports as indicated. Eliminate strain on coil headers. Provide trapped, insulated, DWV copper condensate drain piping full size from the drain connection as shown and extend independently to disposal point as part of this section's work. Provide individual trap from each drain.
- 3.8 Duct Connections: Refer to Division-23 Air Distribution sections. Provide ductwork, accessories, and flexible connections as indicated.
- 3.9 Vibration Isolation: Install in accordance with requirements of Division-23 Vibration Isolation.
- 3.10 Brush out fins on all coils.
- 3.11 Testing: Upon completion of installation, start-up and operate equipment to demonstrate capability and compliance with requirements. Install final, fixed sheave package. Field correct malfunctioning units, then retest to demonstrate compliance.
- 3.12 Install new filters (prefilters and final filters as applicable) at final completion. Provide two spare sets of filters to owner at final completion

END OF SECTION 23 73 23

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 26 05 00 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

The Electrical General Requirements are supplementing and applicable to Division 21 Sections and shall apply to all phases of work specified herein, shown on the Drawings, or required to provide a complete installation of electrical systems. Section 21 is sub-divided for convenience only.

A. This Section includes the following:

1. Job Conditions
2. Regulatory Requirements
3. Electrical equipment coordination and installation.
4. Submittals, Operating and Maintenance instructions and As-built drawings.
5. Common electrical installation requirements.
6. Warranty of work.

1.2 JOB CONDITIONS:

- A. Site Inspections:** Before submitting proposals, each bidder should visit the site and fully familiarize himself with all job conditions and shall be fully informed as to the extent of his work. No consideration will be given after bid opening date for alleged misunderstanding as to the requirements of work involved in connecting to the utilities or as to requirements of materials to be furnished. The contractor shall contact the utility prior to bid and make appropriate provisions in such bid as required by the utility for the utility's routing and connection.
- B. Scheduled Interruptions:** Planned interruptions of utilities service, to any facility affected by this contract, shall be carefully planned and approved by Architect at least ten (10) days in advance of the requested interruption. The Contractor shall not interrupt services until the Architect has granted specific approval. The request shall indicate services to be affected, date and time of interruption and duration of outage. Request for interruption of service will not be approved until all equipment and materials required for the completion of that particular phase of work are on the job site. The work may have to be scheduled after normal working hours.
- C. Accidental Interruptions:** All excavation and/or remodeling work required shall be performed with care so as not to interrupt other existing services (water, gas, electrical, sewer, sprinklers, etc.). If accidental utility interruption resulting from work performed by the Contractor occurs, service shall be immediately restored to its original condition without delay, by and at the expense of the Contractor, using skilled workmen of the trade required.

1.3 REGULATORY REQUIREMENTS:

- A. Permits, Fees, and Inspections: This Contractor shall secure and pay for all permits, and inspections required on work performed under this section of the Specifications. He shall assume full responsibility for all assessments and taxes necessary for the completion and acceptance of the work.

- B. Applicable Standards and Codes: The electrical installation shall comply with all applicable building codes; local, state, and federal ordinances; and the 2011 edition of the National Electrical Code. In case of a discrepancy among these applicable regulatory codes and ordinances, the most stringent requirement shall govern. The Contractor shall notify the Architect in writing of any such discrepancy. Should the Contractor perform any work that does not comply with the applicable regulatory codes and ordinances he shall bear all cost arising in correcting the deficiencies. Application standards and codes shall include all local ordinances, all state laws, and the applicable requirements of the following:
 - 1. American National Standards Institute - ANSI
 - 2. National Electrical Manufacturer's Association - NEMA
 - 3. National Fire Protection Association – NFPA (latest editions)
 - 4. The Life Safety Code – NFPA 101, as adopted in Florida Building Code
 - 5. The National Fire Alarm Code – NFPA 72, as adopted in Florida Building Code
 - 6. Florida Building Code, latest Edition
 - 7. Underwriters' Laboratories, Inc. – UL
 - 8. National Electric Code 2014 – NFPA 70

- C. Drawings and Specifications: The drawings and these specifications are complementary each to the other. What is called for by one shall be as binding as if called for by both. Omissions from the drawings and specifications of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such work. In any case of discrepancy in the figures or catalog numbers, the matter shall be submitted to the Architect, who shall promptly make a determination in writing. Any adjustment by the Contractor shall be at the Contractor's own risk and expense. Electrical drawings are diagrammatic only. Do not scale these drawings. All equipment shall be installed in accordance with manufacturer's recommendations and any conflicting data shall be verified before bidding.

- D. The Contractor shall after completion of the work, furnish the Architect a certificate of final inspection and approval from the applicable local inspection department. Make necessary changes to plans and specifications to meet code standards at no additional cost to the Owner.

1.4 COOPERATION:

- A. Interfacing with Other Crafts: It shall be the responsibility of the Contractor to cooperate and coordinate with all other crafts working on this project. This Contractor shall do all cutting, trenching, backfill and structural removals to permit entry of the electrical system components. The General Contractor shall do all patching and finishing.

- B. Equipment Furnished Under Other Sections: This Contractor shall furnish and install, complete electrical roughing-in and connections to all equipment furnished under other sections and indicate on drawings. This includes all outlets as shown on mechanical, telecom, and electrical drawings. All such equipment shall be set in place as work of other sections.

C. HEATING AND AIR CONDITIONING:

1. The Contractor shall furnish all branch circuit wiring to motors and control panels or centers including disconnects, receptacles, switches, and appurtenances to which the system at the units may be connected, to provide a complete system of wiring for power. Control equipment and control circuit wiring is specified in the Mechanical Section.
2. Control devices to be included in the branch circuit, except those furnished integral with the equipment, will be delivered by the Heating and Air Conditioning Contractor and installed by the Electrical Contractor.

1.5 WORKMANSHIP: All work shall be executed in a neat and substantial manner by skilled workman, well qualified, and regularly engaged in the type of work required. Substandard work shall be removed and replaced by the Contractor at no cost to the Owner.

1.6 APPROVAL OF MATERIALS AND EQUIPMENT:

A. Prior-Submittals: The Contractor shall base his proposal on the materials specified herein and on the drawings. Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of material and equipment required for this installation and is not intended to exclude products equal in quality and similar design. The Architect reserves the sole right to decide the equality of materials proposed for use in lieu of these specified. It shall be the Contractor's responsibility to furnish the information and data sufficient to establish the quality and utility of the items in question, including furnishing of samples if required.

B. Submittals:

1. Submittals: The Contractor shall submit a list of equipment proposed for installation. He shall submit catalog data and shop drawings on all proposed systems and their components. Where substitutions alter the design or space requirements, the Contractor shall defray all items of cost for the revised design and construction including costs to all allied trades involved. Provide an electronic copy and (1) hard copy to the engineer of submittals and shop drawings as a minimum unless the General Conditions requires a greater number of copies.
 - a. Submittals Schedule: Submittals shall be submitted within thirty (30) days after the contract is awarded. It is not the responsibility of the Engineer to expedite the review of submittals if the contractor has not adequately prepared the submittals in a time efficient manner. The contractor bears all the responsibility for the added time requirements of resubmittals.
 - b. Identification: Place a permanent label or title block on each submittal for identification. Each major section of submittals such as power equipment, lighting equipment, fire alarm, etc., shall be secured in a booklet or stapled with a covering index which lists the following information:
 - 1) Project name and date
 - 2) Name, address, and phone number of General contractor and project manager.
 - 3) Name, address, and phone number of Sub-contractor and project manager.
 - 4) Supplier of equipment with phone number and person responsible for this project.
 - 5) Index of each item covered in submittal and model number.
 - 6) Any deviation from contract documents shall be specifically noted on submittal cover index and specifically identified with highlighting, encircling, or boldly on specific submittal sheet.

- c. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1) Include previous submittal review comments.
 - 2) For each item being resubmitted, include previous review comment and explain how resubmitted item meets the criteria of the previous review comment.
- 2. Electrical and Mechanical/Plumbing/Fire Protection Equipment Coordination's:

The electrical power equipment submittals shall be accompanied by a letter verifying coordination of electrical services for all mechanical, plumbing, and fire protection equipment requiring power. The letter shall follow the format listed below.

To: _____
(General Contractor)

Re: _____
(Project name and location)

We the undersigned subcontractors certify that we have coordinated the electrical requirements for mechanical, plumbing, and fire protection sprinkler equipment as evidenced by the coordination chart listed herein.

Item	Load Full Load Amps	1 Phase or 3 Phase	Number of Electrical Connections	Maximum Overcurrent Protection	Minimum Overcurrent Protection	Breaker Proposed	Circuit Proposed

The above list details all required electrical connections for mechanical equipment.

Signed: _____

For: _____
Mechanical Subcontractor

The above list details all required electrical connections for plumbing equipment.

Signed: _____

For: _____
Plumbing Subcontractor

The above list details all required electrical and fire alarm connections for fire protection equipment.

Signed: _____

For: _____
Fire Protection Sprinkler Subcontractor

The above list of equipment has been reviewed and the required connections are being provided. (Any exceptions or request for direction shall be listed here)

Signed: _____

For: _____
Electrical Subcontractor

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protection: Take necessary precautions to protect all material, equipment, apparatus and work from damage. Failure to do so to the satisfaction of the Architect will be sufficient cause for the rejection of the material, equipment or work in question. Contractor is responsible for the safety and good condition of the materials installed until final acceptance by the owner.
- B. Cleaning: Conduit openings shall be capped or plugged during installation. Fixtures and equipment shall be tightly covered and protected against dirt, moisture, chemical and mechanical injury. At the completion of the work the fixtures, material and equipment shall be thoroughly cleaned and delivered in condition satisfactory to the Architect.

1.8 Testing and Balancing: Make tests that may be required by the Owner or the Architect in connection with the operation of the electrical system in the buildings. Balance all single-phase loads connected to all panelboards in the buildings to insure approximate equal divisions of these loads on the main secondary power supply serving the buildings. All tests shall be made in accordance with the latest standards of the IEEE and the NEC. The installation shall be tested for performance, grounds and insulation resistance. A "megger" type instrument shall be used. Contractor shall perform circuit continuity and operational tests on all equipment furnished or connected by Contractor. The tests shall be made in the presence of the Architect or his representative. The Contractor shall notify the Architect at least twenty-four (24) hours in advance of tests. The Contractor shall provide all testing equipment and all costs shall be borne by him. Written reports shall be made of all tests. All faults shall be corrected immediately.

- A. A letter shall be written giving the following:
 - 1. Measured amps on each phase of each panel.
 - 2. Resistance to ground of each new grounding electrode.
 - 3. Measured voltage phase to phase and phase to neutral at each panel.
 - 4. Ground continuity and polarity instrument used.

1.9 OPERATING AND MAINTENANCE INSTRUCTIONS/AS BUILT DRAWINGS:

- A. Four (4) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner. Each set shall be permanently bound and shall have a hard cover. One complete set shall be furnished at the time that the test procedure is submitted, and remaining sets shall be furnished before the Contract is

completed. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2" by 11" with large sheets of Drawings folded in. The instructions shall include information for major pieces of equipment and systems.

- B. Upon completion of the work and at the time designated, the services of one project engineer shall be provided by the Contractor to instruct the representative of the Owner in the operation and maintenance of the systems.
 - C. This Contractor shall provide as-built Drawings at the completion of the job. Drawings shall show all significant changes in equipment, wiring, routing, location, etc. All underground conduit routing shall be accurately indicated with locations dimensioned. As-built drawings shall be submitted for review as red-lined on a field hard copy. After review by the Architect, the Contractor will be given digital AutoCAD files and shall make revisions and resubmit final on disk.
- 1.10 GUARANTEE AND SERVICE: Upon completion of all tests and acceptance, the Contractor shall furnish the Owner a written guarantee covering the electrical work done for a period of one (1) year from date of acceptance. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Upon notice from the Architect or the Owner, the Contractor shall, during the guarantee period, rectify and replace any defective material or workmanship and repair any damage caused thereby without additional cost.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

END OF SECTION 260500

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 26 05 10 – ELECTRICAL METHODS AND BASIC MATERIALS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Supports
- B. Excavation, Trenching, and Backfilling
- C. Cutting and Patching
- D. Equipment Connection
- E. Identification of Equipment
- F. Cleaning and Painting

PART 2 - PRODUCTS

2.1 SUPPORTS:

- A. Framing Steel: Galvanized or painted rolled steel of standard shapes and sizes.
- B. Manufactured Channel: Hot dipped galvanized with all hardware required for mounting as manufactured by Unistrut, Steel City, or approved equal.
- C. Miscellaneous Hardware: Standard sizes treated for corrosion resistance.

2.2 IDENTIFICATION:

- A. Nameplates: Laminated black micarta with ¼” high engraved white letters.
- B. Panel Directories: Typewritten under plastic cover.
- C. Wire and Cable Markers: Cloth, split sleeve, or tubing type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Products shall be installed in accordance with manufacturer's instructions.
- B. Install support systems sized and fastened to accommodate weight of equipment and conduit, including wiring, which they carry.
 - 1. Fasten hanger rods, conduit clamps, and outlet junction boxes to building structure using pre-cast insert system, expansion anchors, preset inserts, beam clamps, or spring steel clips.
 - 2. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion and anchors on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
 - 3. Do not fasten supports to piping, ceiling support wires, ductwork, mechanical equipment, or conduit.
 - 4. Do not use powder-actuated anchors.
 - 5. Do not drill structural steel members without written consent from the Architect.
 - 6. Fabricate supports from structural steel or steel channel.
 - 7. Install surface mounted cabinets and panel boards with minimum of four anchors.
 - 8. Provide steel channel supports to stand cabinets one inch off wall in wet locations.
 - 9. Bridge studs top and bottom with channels to support flush mounted cabinets and panel boards in stud walls.
- C. Excavating, trenching, and backfilling shall be accomplished as indicated on the Drawings or where required to install systems and/or equipment.
 - 1. Trenches for all underground conduits or equipment shall be excavated to the required depths. Where soft, wet, or unstable soil is encountered, the bottom of the trench shall be filled with 6 inches of compacted gravel and sand fill. All trench bottoms shall be tamped hard. Trenches shall be shored as required to meet OSHA requirements and general safe working conditions.
 - 2. After conduits or equipment have been inspected and approved by the Architect and prior to backfilling, all forms shall be removed, and the excavation shall be cleaned of all trash and debris. Material for backfilling shall consist of the excavation, or borrow of sand, gravel, or other materials approved by the Architect and shall be free of trash, lumber or other debris. Backfill shall be placed in horizontal layers, not exceeding 9 inches in depth and properly moistened to approximate optimum requirements. Each layer shall be compacted by hand, or machine tamped to a density equivalent to surrounding soil. Backfill shall be brought to suitable elevation above ground to provide for anticipated settlement and shrinkage. All paving broken up shall be repaired and returned to the original condition.
 - 3. All exterior underground conduits shall have an underground (metal foil) tape installed 12 inches above conduit identified as ELECTRICAL to aid in future location of conduit.
 - 4. All underground conduits shall have an underground red tape installed 12" above conduit.
- D. Cutting and Patching: This Contractor shall provide all cutting, digging, etc., incident to his work and shall make all required repairs thereafter to the satisfaction of the Architect, but in no

case shall the Contractor cut into any major structural element, beam, or column without written approval of the Architect.

1. Pavements, sidewalks, roads, curbs, walls, ceilings, floors, and roofs shall be sawcut, patched, repaired and/or replaced as required to permit the installation of the electrical work. Existing concrete floors and other slabs, which require vertical piercing for installation of conduit raceways shall be neatly core drilled. The Contractor shall carefully lay out his drilling in advance and arrange it to minimize exposed work.
 2. The Contractor shall bear the expense of all cutting, patching, painting, repairing, or replacing of the work of other trades required because of his fault, error, or tardiness or because of any damage done by him.
 3. All patching, and finishing shall be performed by the General Contractor.
- E. Make electrical connections to equipment in accordance with equipment manufacturer's instructions.
1. Verify that wiring and outlet rough-in work is complete and that equipment is ready for electrical connection, wiring, and energization.
 2. Make wiring connections in control panel or in wiring compartment of pre-wired equipment. Provide interconnecting wiring where indicated.
 3. Install and connect disconnect switches, controllers, control stations, and control devices as indicated.
 4. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit in damp or wet locations.
 5. Install pre-fabricated cord set where connections with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.
 6. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.
- F. Identify electrical distribution and control equipment, and loads served, to meet regulatory requirements and as specified herein.
1. Degrease and clean surface to receive nameplates.
 2. Secure nameplates to equipment fronts using screws or rivets with edges parallel to equipment lines.
 3. Each new panel shall have an external nameplate. Disconnect switches, starters or similar devices shall have a mica engraved nameplate mechanically affixed indicating the load served and the location, such as "A/C 2" or "A/C 3 above ceiling". Letters shall be ¼" white on a black background. Panels shall be designated in this manner:

"Panel A
120/208 Volts
3 Phase 4 Wire
Served from Panel MP"
 4. Panel directories shall accurately indicate load served and location of load.
 5. Engrave plates as indicated on the Drawings.

- G. Raceway junction boxes for each system shall be identified by painting the inside of the junction box cover for exposed work and both sides of the covers for concealed work according to the following code:

Receptacle Circuits	Black
120 V. Lighting Circuits	White
208 V. Power & Misc.	Green
277/480 V. Power & Misc.	Yellow
Fire Alarm System	Red
Intercom System	Gray

If the established color code at this site conflicts with the above, the contractor shall so state in a letter outlining his proposed colors to maintain conformity

- H. Install wire markers on each conductor in panel board gutters, boxes, and at load connections.
1. Use distribution panel and branch circuit or feeder number to identify power and lighting circuits.
 2. Use control wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings to identify control wiring.
- I. Cleaning and Painting: The respective Contractors for the various phases of work shall clear away all debris, surplus materials, etc., resulting from their work or operations, leaving the job and equipment furnished in the clean first-class condition.
1. All fixtures and equipment shall be thoroughly cleaned of plaster, stickers, rust, stains and other foreign matter or discoloration, leaving every part in an acceptable condition ready for use.
 2. The Contractor shall refinish and restore to the original condition and appearance, all electrical equipment, which has sustained damage to manufacturer's prime and finish coats or enamel or paint. Materials and workmanship shall be equal to the requirements described for other painting.

END OF SECTION 260510

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS OR LESS)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

- A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

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

2.2 CONDUCTORS AND CABLES

- A. Manufacturers:
 1. American Insulated Wire Corp.; a Leviton Company.
 2. General Cable Corporation.
 3. Senator Wire & Cable Company.
 4. Southwire Company.
 5. Okonite

- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper. Solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger. Aluminum conductors using compact sector stranding will be permitted for circuits 100 amps and above. Contractor shall upsize conductor and conduits for aluminum equivalents and submit for approval.
- D. Conductor Insulation Types: THHN-THWN and SO.

2.3 CONNECTORS AND SPLICES

- A. Manufacturers: AFC Cable Systems, Inc.
 - 1. AMP Incorporated/Tyco International.
 - 2. Hubbell/Anderson.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
- C. Connections from boxes to lay-in fixtures in grid ceiling may be made with MC (metal clad) cable cut to minimum length.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- I. Fire Alarm Circuits: Type THHN-THWN, in raceway.

- J. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- K. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 21 Section "Raceways and Boxes for Electrical Systems."
- F. Seal around cables penetrating fire-rated elements according to Division 21 Section "Firestop Systems and Sleeves."
- G. Identify and color-code conductors and cables according to Division 21 Section "Identification for Electrical Systems."
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 26 05 23 – FIRESTOP SYSTEMS AND SLEEVES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Through penetration firestop systems.
 2. Sleeves for raceways and cables.
 3. Sleeve seals.

1.2 PERFORMANCE REQUIREMENTS

- A. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
 3. L-Rated Systems: Where through-penetration firestop systems are indicated in smoke barriers, provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft (0.01524cu. m/s x sq. m) at both ambient temperatures and 400 deg F (204 deg C).
- B. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- C. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."

- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:
 - 1. A/D Fire Protection Systems Inc.
 - 2. Hilti, Inc.
 - 3. Nelson Firestop Products.
 - 4. NUCO Inc.
 - 5. RectorSeal Corporation (The).
 - 6. Specified Technologies Inc.
 - 7. 3M; Fire Protection Products Division.
 - 8. Tremco; Sealant/Weatherproofing Division.

2.2 FIRESTOPPING

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use

only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

2.3 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Coordinate sleeve selection and application with selection and application of firestopping.

2.4 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Plastic. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

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

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. Include the following information on labels:
1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.

3.2 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage an independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Coordinate sleeve selection and application with selection and application of firestopping.
- C. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

END OF SECTION 260523

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch in diameter by 20 feet long (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install insulated copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.

3. Receptacle circuits.
 4. Single-phase motor and appliance branch circuits.
 5. Three-phase motor and appliance branch circuits.
 6. Flexible raceway runs.
 7. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater and Heat-Tracing Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.
 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
 2. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding and Bonding for Piping: Provide grounding for all new metal pipes.
- E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. After installing new grounding electrode systems but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
 - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Report measured ground resistances that exceed 5 ohms.

END OF SECTION 260526

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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SECTION 26 05 29 - ELECTRICAL SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.2 SUBMITTALS

- A. Product Data: Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of support component used.
- B. Shop Drawings for Supports: For supports and their attachments to structure not defined on Drawings, identify hardware, and indicate analysis, forces, strengths, materials, and dimensions, signed and sealed by a qualified professional engineer.

1.3 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed under this Project, with a minimum structural safety factor of five the applied force.

- B. Steel Slotted Support Systems: Comply with MFMA-3, factory-fabricated components for field assembly, and provide finish suitable for the environment in which installed.
 - 1. Available Manufacturers:
 - a. Cooper B-Line; a division of Cooper Industries.
 - b. ERICO International Corporation.
 - c. Allied Support Systems; Power-Strut Unit.
 - d. GS Metals Corp.
 - e. Michigan Hanger Co., Inc.; O-Strut Div.
 - f. National Pipe Hanger Corp.
 - g. Thomas & Betts Corporation.
 - h. Unistrut; Tyco International, Ltd.
 - i. Wesanco, Inc.
 - 2. Channel Dimensions: Selected for structural loading.
- C. Raceway and Cable Supports: As described in NECA 1.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers:
 - 1) Cooper B-Line; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Construction Products.
 - 5) MKT Fastening, LLC.
 - 6) Powers Fasteners.
 - 2. Concrete Inserts: Steel or malleable-iron slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
 - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 4. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
 - 5. Toggle Bolts: All-steel springhead type.
 - 6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 for application of hangers and supports for electrical equipment and systems, unless requirements in this Section or applicable Code are stricter.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 for installation requirements, except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods, unless otherwise indicated by Code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions.
- B. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so expansion anchors will be a minimum of 10 bolt diameters from edge of the base.
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of the base.
 - 2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 6. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete.

3.5 INSTALLATION OF SEISMIC-RESTRAINT COMPONENTS

- A. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Restraint Cables: Provide slack within maximums recommended by manufacturer.
- D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

3.6 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Make flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross expansion joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to electrical equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

END OF SECTION 260529

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. See Division 26 Section "Firestops System and Sleeves" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
- C. See Division 26 Section "Electric Methods and Basic Materials" for supports, anchors, and identification products.
- D. See Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

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

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflec Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. EMT and Fittings: ANSI C80.3.

1. Fittings: Steel, Set-screw or compression type. No die-cast.

D. LFMC: Flexible steel conduit with PVC jacket.

E. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arneo Corp.
4. Cantex Inc.
5. Certaineed Corp.; Pipe & Plastics Group.
6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiraldut, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 METAL WIREWAYS

A. Manufacturers:

1. Hoffman.
2. Square D.

- B. Material and Construction: Sheet metal sized and shaped as indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Screw-cover type.
- F. Finish: Manufacturer's standard enamel finish.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers:
 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. Emerson/General Signal; Appleton Electric Company.
 3. Erickson Electrical Equipment Co.
 4. Hoffman.
 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 6. O-Z/Gedney; Unit of General Signal.
 7. RACO; Division of Hubbell, Inc.
 8. Thomas & Betts Corporation.
 9. Walker Systems, Inc.; Wiremold Company (The).
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- H. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel.
2. Concealed: Rigid steel.
3. Underground, Single Run: SCH 40 PVC.
4. Underground, Grouped: SCH 40 PVC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT in unfinished areas where shown or permitted.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations or where exposed to view (not concealed).
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.
6. Flexible metal conduit: Where applications are not concealed by the building construction, liquid tight flexible conduit and grounding type fittings shall be used and system shall be fully bonded.

C. Minimum Raceway Size: 1/2-inch trade size (DN 16), except underground shall be 3/4" minimum.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as required by NEC.
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.

- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor, except PVC branch circuits may rise concealed in walls to first box maximum 48" AFF.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull cords in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull cord.
- N. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.

- O. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- P. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations or where exposed to view (not concealed). Install separate ground conductor across flexible connections.
- Q. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- R. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Identification for conductors and communication and control cable.
 - 2. Warning labels and signs.
 - 3. Equipment identification labels.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.

- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Fasteners for Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.
- E. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 mm)."

2.3 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

PART 3 - EXECUTION

3.1 APPLICATION

- A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
 - 2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - 1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
 - c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.
 2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Electrical switchgear and switchboards.
 - c. Disconnect switches.
 - d. Enclosed circuit breakers.
 - e. Motor starters.
 - f. Push-button stations.
 - g. Power transfer equipment.
 - h. Contactors.
 - i. Receptacles: Provide panel and circuit designation.

3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 1. Color shall be factory applied.
 2. Colors for 208/120-V Circuits: (unless existing color code is different)

- a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Neutral: White.
3. Colors for 480/277V circuits: (unless existing color code is different)
- a. Phase A: Orange
 - b. Phase B: Yellow
 - c. Phase C: Brown
 - d. Neutral: Gray

END OF SECTION 260553

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 26 06 00- SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Grounding and bonding
- B. Service entrance
- C. Utility requirements
- D. Panelboards
- E. Enclosed switches
- F. Fuses
- G. Contactors

1.2 SERVICE TYPE DESCRIPTION: Electric Service System shall be 480/277 volts 3 phase 4 wire served from an existing service.

1.3 PROJECT CONDITIONS: Verify field measurements for the equipment to ensure proper fit within the space provided.

1.4 UTILITY REQUIREMENTS:

- A. The serving utility is Gulf Power Company (GPC).
 - 1. The Owner will pay directly to the Utility for all assessments, service charges, fees, etc. from the utility for service requirements.
 - 2. The Owner will provide required easements to the electric Utility.

1.5 EQUIPMENT APPLICATION: All equipment and materials shall have ratings established by a recognized independent agency or laboratory. The Contractor shall apply the items used on this project within those ratings and application shall be subject to any stipulations or exceptions established by the independent agency or laboratory. Use of equipment or materials in applications beyond that certified by the agency or beyond that recommended by the manufacturer shall be cause for removal and replacement of such misapplied items

PART 2 - PRODUCTS

2.1 GROUNDING MATERIALS:

- A. Ground rod: 16 feet x 3/4" diameter, copper clad steel, sectional driven.
- B. Ground connectors: Approved ground clamp manufactured of cast bronze construction with matching bolts, nuts, and washers.
- C. Exothermic welds: Materials shall be from the same source. Welding process shall be Cadweld or approved equal.
- D. Grounding conductors: Green colored and coded insulated copper (#12 AWG minimum) or bare soft drawn copper as indicated on Drawings.

2.2 SWITCHBOARD:

- A. Switchboard: NEMA PB2.
 - 1. Line and Load Terminations: Accessible from the front only of switchboard, suitable for conductor materials used.
 - 2. Main Sections Devices: Individually mounted.
 - 3. Distribution Section Devices: Panel mounted.
- B. Bussing:
 - 1. Bus Material: Plated Copper or Plated Aluminum sized in accordance with NEMA PB2.
 - 2. Bus Connections: Accessible from front for maintenance.
 - 3. Ground Bus: Plated Copper or Plated Aluminum.
- C. Enclosure: Type 1 General Purpose as shown on the Drawings.
 - 1. Align sections at rear.
 - 2. Finish: Manufacturer's standard light gray enamel over external surfaces.
- D. Future provisions:
 - 1. Fully equip spaces for future devices with bussing and bus connection provisions; continuous current rating as indicated on the Drawings.
 - 2. Do not taper main bus rating.
- E. Switching and over-current protection devices:
 - 1. Molded Case Circuit Breakers: NEMA AB 1.
 - 2. Solid State Molded Case Circuit Breakers: NEMA AB 1; with electronic sensing, timing and tripping circuits for adjustable trip settings; ground fault trip; instantaneous trip and adjustable short time trip.
- F. Switchboard instruments:

1. Advanced electrical meter: Mount in face of switchboard with electronic retrieval of real time reading and maximum monthly readings.

G. Manufacturers:

1. Eaton or Cutler Hammer – Powerline C Switchboard or approved equal by Siemens, GE or Square D Company.

H. Engraved micarta nameplates: shall be provided for each branch.

2.3 PANELBOARDS:

A. Distribution panelboards: NEMA PB 1; circuit breaker type.

1. Bus Material: Plated Copper or Plated Aluminum.
2. Ground Bus: Plated Copper or Plated Aluminum.
3. Enclosures: Type 1 or 3R as shown on the Drawings.
4. Mounting: Surface or flush mount as indicated on the Drawings.
5. Door: Hinged with lock. Door assembly shall be hinged to enclosure for panels rated 250 amps or larger.
6. Circuit Breakers: Bolt-on, ratings as shown on Drawings.
7. Distribution Panelboards: without doors shall have engraved micarta nameplates for each breaker.

B. Light and power panelboards: NEMA PB 1; circuit breaker type.

1. Bus Material: Plated Copper or Plated Aluminum.
2. Ground Bus: Plated Copper or Plated Aluminum.
3. Enclosures: Type 1 or 3R as shown on the Drawings.
4. Mounting: Surface or flush mount as indicated on the Drawings.
5. Door: Hinged with lock.
6. Circuit Breakers: Bolt-on, ratings as shown on Drawings.

C. Accessories: Provide panel and branch device accessories as indicated on the Drawings

D. Future provisions: Where space provisions are indicated on the Drawings, provide bussing, bus extensions, etc. required to mount future circuit breakers. Where spare provisions are indicated on the Drawings, provide circuit breakers complete and ready for connection.

E. Manufacturers:

1. Eaton or Cutler Hammer – Powerline C Switchboard or approved equal by Siemens, GE or Square D. Company.

2.4 FUSES:

A. Service Entrance/Feeder Circuits – 600 Amp and smaller.

1. U.L. Class RK1

2. Current Limiting
3. 200,000-amp RMS Interrupt Rating
4. Voltage Rating: As required for system compatibility

B. Motor, Motor Controller, Transformer and Inductive Circuits.

1. U.L. Class RD1, Time Delay
2. Current Limiting
3. 200,000-amp RMS Interrupt Rating
4. Voltage Rating: As required for system compatibility

C. Manufacturers:

1. Square D Company
2. Siemens
3. Cutler – Hammer
4. General Electric

2.5 ENCLOSED CIRCUIT BREAKERS:

A. Circuit breaker: NEMA AB 1; Voltage and Accessories as indicated on Drawings.

B. Enclosures: Code gauge steel, NEMA 1 or 3R as required.

C. Manufacturers:

1. Square D Company
2. Siemens
3. Cutler – Hammer
4. General Electric

2.6 CONTACTORS:

A. Mechanically held contactors: NEMA ICS 2; mechanically held, electrically operated.

B. Electrically held contactors: NEMA ICS 2; electrically held, electrically operated.

C. Coil operating voltage: 120 volts, 60 Hz.

D. Enclosures: NEMA ICS 6; Type 1 or 3R as required.

PART 3 – EXECUTION

3.1 EXAMINATION AND PREPARATION:

- A. Make arrangements with utility company to obtain permanent electrical service to the facility. Provide CT Cabinet and Meter base as required by utility for service connection.

3.2 INSTALLATION:

- A. Install utility services in accordance with utility company standards and requirements.
 - 1. Underground Service: Install service entrance conduits and conductors from the utility service point to the service equipment as shown on the Drawings.
 - 2. Provide lugs on utility transformer spaces sized to accommodate service entrance conductors.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Except where specifically indicated otherwise, all exposed non-current-carrying metallic parts of electrical equipment, metallic raceway systems, and service neutral of the electrical system shall be grounded.
 - 1. Equipment grounding shall be accomplished by installing a separate grounding conductor in each raceway of the system. The Conductor shall be provided with a distinctive green insulation or marker and shall be sized in accordance with Article 250 of the National Electrical Code.
 - 2. The electrical system grounding electrode connection shall be made at the main service equipment and shall be extended to the point of entrance of the metallic cold water service. A suitable ground clamp shall make connection to the water pipe. If flanged pipes are encountered, connection shall be made on the street side of the flange connection. If the metallic water service is coated with an insulating material or there is no metallic water service to the building, ground connection shall be made to additional ground rods as required by resistance tests, at the exterior of the building driven full length into the earth.
 - 3. The maximum resistance of the driven ground shall be tested with a ground resistance Megger and shall not exceed 25 ohms under normally dry conditions. If this cannot be obtained with a single rod, additional or parallel rods shall be installed 7'-6" on center until 25 ohms or less is achieved without connection to the building water piping. A typewritten test report shall be written.
- D. Install panelboards to NEMA PB 1.1.
- E. Provide labels for all, panelboards, and distribution equipment.
- F. Provide label for each breaker/switch position in switchboards and distribution (feeder) panelboards.
- G. Provide typewritten directory inside panel door for all panelboards.

END OF SECTION 260600

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 26 09 23 – LIGHTING CONTROLS AND DEVICES

PART 1 – GENERAL

1. SECTION INCLUDES

- A. Network lighting control system and components:
 - 1. Lighting management panels
 - 2. Lighting management modules
 - 3. Low voltage wall stations
 - 4. Wired sensors

2. RELATED DOCUMENTS

- A. Section 262726 Wiring Devices
- B. Section 265100 Interior Lighting Fixtures

1.3 SUMMARY

- A. The lighting control system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control
- B. The system shall be capable of turning lighting loads on/off as well as dimming lights (if lighting load is capable of being dimmed). Specific dimmers will be capable of “dimming lights to off”
- C. All system devices shall be networked together, enabling digital communication between devices.
- D. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity, even if network connectivity to the greater system is lost.
- E. The system architecture shall facilitate remote operation via a computer connection.

1.4 SUBMITTALS

- A. Product Datasheets (general device descriptions, dimensions, electrical specifications, wiring details, nomenclature)
- B. Riser Diagrams – typical per room type (detailed drawings showing interconnectivity of devices)
- C. Other Diagrams – as needed for special operation or interaction with other system(s)

- D. Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory start-up
- E. Hardware and Software Operation Manuals.
- F. Other operational descriptions as needed.

1.5 ON-SITE COMMISSIONING REQUIREMENTS

A. Pre-Wire Meeting Requirements

1. Certified Technician will meet onsite with the electrical contractors to coordinate installation details, review best practices, and discuss project specific challenges. This should happen prior to the installation being started, enabling the contractors to work with a lighting systems expert to prepare and make changes up prior to installation commencement.

B. A manufacturer’s lighting systems team works onsite, after fixture and controls installation is completed. The project is reviewed and checked for proper wiring, installation and functionality of the system as a whole. Any problems are addressed and resolved with the onsite contractors. If fixture addressing is required, the manufacturer’s technicians will perform this task in accordance with the intended lighting design.

C. Onsite programming requirements

1. Manufacturer’s technicians map out the fixture locations and addresses within the lighting control software. Astronomic timeclock events, scenes, and schedules are programmed per a pre-defined script. These events, scenes, and schedules are tested and finalized for final approval by the project’s ownership.

D. Training requirements

1. Manufacturer’s technicians provide training for system users and the system maintenance team. The details of the technology are covered from a maintenance and troubleshooting point of view. This covers the lighting control system and its core functionality, with a focus on how to edit existing scenes and astronomic lighting events.
2. The manufacturer’s representative will provide in-depth training to the end user on managing the specific control system, giving them the tools and knowledge to operate their system.

1.6 PROJECT CLOSEOUT DOCUMENTATION

A. Provide a factory published manual

1. Warranty
2. Technical support contact
3. Electronic manual on manufacturer’s website for free download

1.5 QUALITY ASSURANCE

A. All components and the manufacturing facility where product was manufactured must be RoHS compliant.

- B. In high humidity or cold environments, the sensors shall be conformably coated and rated for condensing humidity and -40 degree Fahrenheit (and Celsius) operation.
- C. All applicable products must be UL / CUL Listed or other acceptable national testing organization.

1.6 PROJECT CONDITIONS

- A. Only install equipment after the following site conditions are maintained:
 - 1. Ambient Temperature 14 to 105 degrees F (-10 to 40 degrees C)
 - 2. Relative Humidity less than 90% non-condensing
- B. Standard electrical enclosures are permanently installed
- C. Equipment is protected from dust, debris and moisture

1.7 WARRANTY

- A. Five (5) year 100% parts replacement

1.8 MAINTENANCE & SUSTAINABILITY

- A. Provide new parts, upgrades, and/or replacements available for a minimum of 5 years available to the end user
- B. Provide free telephone technical support

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Basis of controls design Manufacturer:
*Acuity Brands, One Lithonia Way
Conyers GA 30012
www.acuitycontrols.com*
- B. Substitutions: Permitted with PRIOR APPROVAL ONLY:
 - 1. All substitutions must be submitted in writing for approval at least 14 days prior to bid date.
 - 2. Proposed substitute products must be documented with a line by line compliance review.
 - 3. Proposal substitute must provide contractor submittal revised lighting plans, lighting control risers and details.

2.2 SYSTEM REQUIREMENTS

- A. System shall have an architecture that is based upon three main concepts;
 - 1. intelligent lighting control devices

2. standalone lighting control zones
 3. network backbone for remote or time based operation.
- B. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.
- C. System must interface directly with LED luminaires.
- D. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.
- E. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
- F. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, controls enabled luminaires, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.
- G. System shall have one or more primary wall mounted network control “gateway” devices that are capable of accessing and controlling connected system devices and linking into an Ethernet LAN.
- H. System shall have a web-based software management program that enables remote system control, status monitoring, and creation of lighting control schedules and profiles.
- I. Individual lighting zones shall be capable of being segmented into several “local” channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.
- J. Devices located in different lighting zones shall be able to communicate occupancy, photocell (non-dimming), and switch information via the wired backbone.
- K. System shall be capable of operating a lighting control zone according to several sequences of operation. System shall be able to change a spaces sequence of operation according to a time schedule so as to enable customized time-of-day, day-of-week, utilization of a space. Note: Operating modes should be utilized only in manners consistent with local energy codes.
1. Auto-On / Auto-Off (via occupancy sensors)
 - a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
 - b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
 - c. Pressing a switch will turn lights off. The lights will remain off regardless of occupancy until switch is pressed again, restoring the sensor to Automatic On functionality.
 2. Manual-On / Auto-Off (also called Semi-Automatic)
 - a. Pushing a switch will turn lights on.
 - b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
 3. Manual-On to Auto-On/Auto-Off

- a. Pushing a switch will turn lights on.
 - b. After initial lights on, zones with occupancy and/or photocell sensors turn lights on/off according to occupancy/vacancy and/or daylight conditions.
 - c. Sequence can be reset via scheduled (ex. daily each morning) events.
4. Auto-to-Override On
- a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
 - b. Zone lighting then goes into an override on state for a set amount of time, or until the next time event returns the lighting to an auto-off style of control.
 - c. Sequence can be reset via scheduled (ex. daily each morning) events.
5. Manual-to-Override On
- a. Pushing a switch will turn lights on.
 - b. Zone lighting then goes into an override on state for a set amount of time or until the next time event returns the lighting to an auto-off style of control.
 - c. Sequence can be reset via scheduled (ex. daily each morning) events.
6. Auto On / Predictive Off
- a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
 - b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
 - c. Pressing the switch will turn the lights off and a short “exit timer” begins. After the timer expires, sensor scans the room to detect whether occupant is still present. If no occupancy is detected, zone returns to auto-on. If occupancy is detected, lights must be turned on via the switch.
7. Multi-Level Operation (multiple lighting levels per manual button press)
- a. Operating mode designed specifically for bi-level applications.
 - b. Enables the user to cycle through up to four potential on/off/dim low/dim high lighting states using only a single button.
 - c. Eliminates user confusion as to which of two buttons controls which load
 - d. Three different transition sequences are available in order to comply with energy codes or user preference).
 - e. Mode available as a setting on all devices that have single manual on/off switch.
 - f. Depending on the sequence selected, every button push steps through relay/dimming states according to below table
 - g. In addition to achieving bi-level lighting control by switching loads with relays, the ability to command dimming outputs to “step” in a sequence that achieves bi-level operation is present.

MLO Mode		State of load after each pushbutton press			
		1st Press	2nd Press	3rd Press	4th Press
2-State (Alternating)	Load A	On	Off	Off	-
	Load B	Off	On	Off	-
2-State (Both On, A First)	Load A	On	On	Off	-
	Load B	Off	On	Off	-
2-State (Both On, B First)	Load A	Off	On	Off	-
	Load B	On	On	Off	-
3-State	Load A	On	Off	On	Off
	Load B	Off	On	On	Off
A and B On ¹	Load A	On	Off	-	-
	Load B	On	Off	-	-
A On Only ¹	Load A	On	Off	-	-
	Load B	Off	Off	-	-
A and B On & Dim High ¹	Load A	High	Off	-	-
	Load B	High	Off	-	-
Dim Low /High	Load A	Low	High	Off	-
Dim Low / High	Load A	High	Low	Off	-

NOTE 1: Modes for use only when Auto-On state of Load A & B is different than first MLO state

- L. A taskbar style desktop application shall be available for personal lighting control.
- M. An application that runs on “smart” handheld devices (such as an Apple® iPhone®) shall be available for personal lighting control.
- N. Control software shall enable logging of system performance data and presenting this information in a web-based format and downloadable to .CSV files.
- O. Control software shall enable integration with a BMS via BACnet IP, although a hardware BACnet IP integration solution is also available.

2.3 INDIVIDUAL DEVICE SPECIFICATIONS

- A. Control module (gateway)
 1. Control module shall be a device that facilitates communication and time-based control of downstream network devices and linking into an Ethernet network.
 2. Devices shall have a user interface that is capable of wall mounting and be powered by low voltage.
 3. Device shall have a standard and astronomical internal time clock.
 4. Device shall have one RJ-45 10/100 BaseT Ethernet connection.
 5. Device shall have a USB port
 6. Device shall be capable of using a dedicated static or DHCP assigned IP address.
- B. Networked system occupancy sensors
 1. Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.

2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted.
3. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.
4. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.
5. All sensing technologies shall be acoustically passive, meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.
6. Sensors shall be available with zero or one integrated dry contact switching relays, capable of switching 1 amp at 24 VAC/VDC (resistive only).
7. Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.
8. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
9. All sensors shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate of a potential wiring issue
10. Every sensor parameter shall be available and configurable remotely from the software and locally via the device push-button.
11. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas.
12. Sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements.
13. Wall switch sensors shall recess into single-gang switch box and fit a standard GFI opening.
14. Wall switch sensors must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.
15. Wall switch sensors shall have optional features for photocell/daylight override, and low temperature/high humidity operation.
16. Wall switch sensors shall be available in four standard colors (Ivory, White, Light Almond, Gray)
17. Wall switch sensors shall be available with optional raise/lower dimming adjustment controls.
18. Network system shall have sensors that can be embedded into luminaire such that only the lens shows on luminaire face.
19. Embedded sensors shall be capable of both PIR and Dual Technology occupancy detection
20. Embedded sensors shall have an optional photocell
21. Network system shall also have ceiling, fixture, recessed, & corner mounted sensors available.
22. Sensors shall have optional features for photocell/daylight override, dimming control, and low temperature/high humidity operation.

C. Networked system daylight (photocell and/or dimming) sensors

1. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
2. Photocell and dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.
3. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
4. Photocell and dimming sensors shall be equipped with an automatic override for 100-hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)
5. Combination units that have all features of on/off photocell and dimming sensors shall also be available.
6. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The second zone shall be capable of being controlled as an "offset" from the primary zone.
7. Network system shall have dimming photocells that can be embedded into luminaire such that only the lens shows on luminaire face.

D. Networked system power (relay) packs

1. Power Packs shall incorporate one Class 1 relay, a 0-10 VDC dimming output, and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output but shall not be required to contribute system power. Power Supplies shall provide system power only but are not required to switch line voltage circuit.
2. Power Packs shall accept 120 or 277 VAC (or optionally 347 VAC), be plenum rated, and provide Class 2 power to the system.
3. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
4. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
5. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
6. Power Packs (Secondary) shall be available that provide up to 16 Amp switching of all lighting load types.
7. Power Packs shall be available that provide up to 5 Amps switching of all lighting load types as well as 0-10 VDC dimming or fluorescent ballasts/LED drivers.
8. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120/277 VAC magnetic low voltage transformers.
9. Specific Secondary Packs shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.
10. Specific Power/Secondary Packs shall be available that are UL924 listed for switching of Emergency Power circuits.
11. Specific Secondary Packs shall be available that control louver/damper motors for skylights.
12. Specific Secondary Packs shall be available that provide a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.

13. Power (Secondary) Packs shall be available that provide up to 20 Amps switching of general purposed receptacle (plug-load) control.

E. Networked auxiliary input / output (i/o) devices

1. Devices shall be plenum rated and be inline wired, screw mountable, or have an extended chase nipple for mounting to a ½” knockout.
2. Devices shall have two RJ-45 ports
3. Specific I/O devices shall have a dimming control output that can control 0-10 VDC dimmable ballasts or LED drivers by sinking up to 20 mA of current.
4. Specific I/O devices shall have an input that reads a 0-10 VDC signal from an external device.
5. Specific I/O devices shall have a switch input that can interface with either a maintained or momentary switch and run a switch event (toggle the lighting load) or run a local/remote control profile.
6. Specific I/O devices shall sense state of low voltage outdoor photocells.
7. Specific I/O devices shall sense momentary and maintained contact closures, and either toggle a connected load after a momentary contact or ramp the load high/low during a maintained contact (stopping when the contact releases).

F. Networked system wall switches & dimmers

1. Devices shall recess into single-gang switch box and fit a standard GFI opening.
2. All devices shall provide toggle switch control. Dimming control and low temperature/high humidity operation are available options.
3. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
4. Devices with mechanical push-buttons shall provide tactile and LED user feedback.
5. Devices with mechanical push-buttons shall be made available with custom button labeling
6. Devices with a single “on” button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.

G. Networked system scene controllers

1. Device shall have two, three, four, or eight buttons for selecting programmable lighting control profiles or acting as on/off switches.
2. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
3. Device shall recess into single-gang switch box and fit a standard GFI opening.
4. Devices shall provide LED user feedback.
5. Device shall be capable of reprogramming other devices in its zone so as to implement user selected lighting scene.
6. Device shall be capable of selecting a lighting profile be run by the system’s upstream Gateway so as to implement selected lighting profile across multiple zones (and not just its local zone).
7. Device shall have LEDs indicating current selection.

H. Communication Bridges

1. Device shall surface mount to a standard 4” x 4” square junction box.
2. Device shall have 8 or more RJ-45 ports.
3. Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to Control Gateway.

4. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply or delivered via a CAT-5 cabled connection.
5. Device shall be capable of redistributing power from its local supply and connect lighting control zones with excess power to lighting control zones with insufficient local power.

2.4. LIGHTING CONTROL PROFILES

- A. Changes to the operation of the system shall be capable of being made in real-time or scheduled via lighting control profiles. These profiles are outlines of settings that direct how a collection of devices function for a defined time period.
- B. Lighting control profiles shall be capable of being created and applied to a single device, zone of devices, or customized group of zones.
- C. All relays and dimming outputs shall be capable of being scheduled to track or ignore information regarding occupancy, daylight, and local user switches via lighting control profiles.
- D. Specific device parameters (e.g. sensor time delay and photocell set-point) shall be configurable via a lighting control profile.
- E. All lighting control profiles shall be stored on the network control gateway device, with a system backup on the software's host server.
- F. Lighting control profiles shall be capable of being scheduled to run according to the following calendar options: start date/hour/minute, end date/hour/minute, and sunrise/sunset +/- timed offsets.
- G. Sunrise/sunset times shall be automatically derived from location information using an astronomical clock.
- H. Daylight savings time adjustments shall be capable of being performed automatically, if desired.
- I. Lighting control profile schedules shall be capable of being given the following recurrence settings: daily, weekday, weekend, weekly, monthly, and yearly.
- J. Software shall provide a graphical tool for easily viewing scheduled lighting control profiles.

2.5. MANAGEMENT SOFTWARE

- A. Every device parameter (e.g. sensor time delay and photocell set-point) shall be available and configurable remotely from the software
- B. The following status monitoring information shall be made available from the software for all devices for which it is applicable: current occupancy status, current PIR Status, current Microphonics Status, remaining occupancy time delay(s), current photocell reading, current photocell inhibiting state, photocell transitions time remaining, current dim level, device temperature, and device relay state(s).

- C. The following device identification information shall be made available from the software: model number, model description, serial number, manufacturing date code, custom label(s), and parent network device.
- D. A printable network inventory report shall be available via the software.
- E. A printable report detailing all system profiles shall be available via the software.
- F. Software shall require all users to login with a User Name and Password.
- G. Software shall provide at least three permission levels for users.
- H. All sensitive stored information and privileged communication by the software shall be encrypted.
- I. All device firmware and system information shall be readily accessible.
- J. Software shall be capable of managing systems interconnected via a WAN (wide area network)

2.6. BMS COMPATIBILITY

- A. System shall provide a BACnet IP gateway as a downloadable software plug-in to its management software.
- B. BACnet IP connection shall also be available utilizing JACE-600 hardware unit
- C. BACnet IP connection shall communicate information gathered by networked system to other building management systems.
- D. BACnet IP connection shall translate and forward lighting relay and other select control commands from BMS system to networked control devices via profiles stored in the system Gateway. All system devices shall be available for polling for devices status.

2.8. START-UP & SUPPORT FEATURES

- A. To facilitate start-up, all devices shall automatically be grouped together into a functional lighting control zone.
- B. All lighting control zones shall be able to function according to default settings once adequate power is applied and before any system software is installed.
- C. Once software is installed, system shall be able to auto-discover all system devices without requiring any commissioning.
- D. All system devices shall be capable of being given user defined names.
- E. All devices within the network shall be able to have their firmware upgraded remotely and without being physically uninstalled for purposes of upgrading functionality at a later date.
- F. All sensor devices shall have the ability to detect improper communication wiring and blink it's LED in a specific cadence as to alert installation/startup personnel.

END OF SECTION 260943

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 26 12 16 - DRY-TYPE TRANSFORMERS (600 V AND LESS)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of dry-type transformers rated 600 V and less:
 - 1. Distribution transformers.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Wiring and connection diagrams.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with IEEE C 57.12.91.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Cutler-Hammer.
2. GE Electrical Distribution & Control.
3. Siemens Energy & Automation, Inc.
4. Square D/Groupe Schneider NA.

2.2 MATERIALS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices, except for taps.
 1. Internal Coil Connections: Brazed or pressure type.
 2. Coil Material: Copper or Aluminum

2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561.
- B. Cores: One leg per phase.
- C. Enclosure: Ventilated, NEMA 250, Type 2 and Ventilated, raintight, NEMA 250, Type 3R
- D. Retain subparagraph below with any option selected from paragraph above.
 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
 2. Finish Color: Gray
- E. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
- F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
- G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- H. Wall Brackets: Manufacturer's standard brackets.

2.4 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.1 INSTALLATION

Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

3.2 CONNECTIONS

- A. Ground equipment according to Division 21 Section "Grounding and Bonding."
- B. Connect wiring according to Division 21 Section "Conductors and Cables."

3.3 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 5 percent. Submit recording and tap settings as test results.
- B. Adjust buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.
- C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 261216

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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JANUARY 29, 2019**

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
 - 3. Field quality-control test reports.
 - 4. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corporation; Cutler-Hammer Products.
 - b. Siemens Energy & Automation, Inc.
 - c. Square D.

2.2 MANUFACTURED UNITS

- A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.
 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 - b. Kitchen Areas: NEMA 250, Type 4X, Type 3R.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 3R.
 - d. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- B. Phase and Ground Buses: Tin-plated Copper or Aluminum.
- C. Conductor Connectors: Suitable for use with conductor material.
 1. Ground Lugs and Bus Configured Terminators: Compression type.
- D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- F. Panelboard Short-Circuit Rating:
 1. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.
 2. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.3 BREAKERS

- A. Breakers for existing panelboards, distribution panelboards or switchboard shall match existing minimum interrupting capacities.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.
 - 3. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - a. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for switching high intensity discharge lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - c. Shunt Trip: 120-V trip coil energized from separate circuit.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Furnish portable test set to test functions of solid-state trip devices without removal from panelboard.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.

- B. Comply with mounting and anchoring requirements specified in Division 21 Section "Electrical Supports."
- C. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits out below slab to exterior and cap both ends.
- H. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 21 Section "Identification of Electrical Systems."
- I. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- J. Ground equipment according to Division 21 Section "Grounding and Bonding."
- K. Connect wiring according to Division 21 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 262416

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Single and duplex receptacles, ground-fault circuit interrupters, and integral surge suppression units.
2. Single- and double-pole snap switches and dimmer switches.
3. Device wall plates.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.

- b. Hubbell Incorporated; Wiring Device-Kellems.
- c. Leviton Mfg. Company Inc.
- d. Pass & Seymour/Legrand; Wiring Devices Div.

2. Multioutlet Assemblies:

- a. Hubbell Incorporated; Wiring Device-Kellems.
- b. Wiremold Company (The).

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
- C. Straight-Blade Receptacles: Manufacturer's top grade below Hospital grade.
- D. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.
- E. Receptacles in Exceptional Student Education (ESE) classroom(s) shall be tamper resistant and GFCI type.

2.3 PENDANT CORD/CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty grade.
 - 1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
 - 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.4 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: Heavy-Duty grade, quiet type.
- C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
 - 1. Switch: 20 A, 120/277-V ac.
 - 2. Receptacle: NEMA WD 6, Configuration 5-20R.
- D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.

1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.
2. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.
3. LED Dimmer Switches: Modular; compatible with dimmer drivers; trim potentiometer to adjust low-end dimming; dimmer-driver combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Smooth Metal 302/304 stainless steel with satin finish.
 3. Material for Unfinished Spaces: Smooth Metal 302/304 stainless steel with satin finish except where shown surface shall be "bell" die-cast aluminum with similar plates.
 4. Material for Wet Locations: Cast aluminum with in-use lift cover, and listed and labeled for use in "wet locations."

2.6 FINISHES

- A. Color:
 1. Wiring Devices: Gray

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging.
- C. Install unshared neutral conductors on line and load side of dimmers.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- E. Remove wall plates and protect devices and assemblies during painting.

3.2 IDENTIFICATION

- A. Comply with Division 21 Section "Identification for Electrical Systems."

3.3 CONNECTIONS

- A. Ground equipment according to Division 21 Section "Grounding and Bonding."
- B. Connect wiring according to Division 21 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test every outlet for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 262726

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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JANUARY 29, 2019**

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers.
 - 4. Enclosures.

1.2 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

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

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. Siemens Energy & Automation, Inc.
3. Square D/Group Schneider.
4. General Electric

B. Fusible Switch, 600 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 600 A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. Siemens Energy & Automation, Inc.
3. Square D/Group Schneider.
4. General Electric

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
4. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.4 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
 1. Outdoor Locations: NEMA 250, Type 3R.
 2. Kitchen Areas: NEMA 250, Type 4XSS except floor receptacles for kitchen distribution shall be as detailed on drawings.
 3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated.
- C. Comply with mounting and anchoring requirements specified in Division 21 Section "Electrical Supports."
- D. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 2 Section "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Prepare for acceptance testing as follows:
 1. Inspect mechanical and electrical connections.
 2. Verify switch and relay type and labeling verification.
 3. Verify rating of installed fuses.
- B. Perform the following field tests and inspections and prepare test reports:
 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 262816

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
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SECTION 26 43 13 - SURGE PROTECTIVE DEVICES

PART 1 – GENERAL

1.1 SUMMARY:

This section describes the quality, performance, and installation of Parallel Connected, AC Power, Panel Type, Surge Protective Devices (SPDs).

1.2 QUALITY ASSURANCE:

All Surge Protective Devices (SPDs) shall be tested and *listed* to *ANSI/UL 1449-2006 (UL 1449 3rd Edition)* and Complimentary Listed to UL 1283 by an independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction. This agency must comply with ANSI/IEEE C62.45 test procedures for all categories established in C62.41 (1991). “Manufactured in accordance with UL 1449” is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification.

1.3 CODES AND STANDARDS:

- A. ANSI/IEEE Std C62.41.1™-2002, IEEE Guide on the Surge Environment in Low- Voltage (1000 V and Less) AC Power Circuits
- B. ANSI/IEEE Std C62.41.2™-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
- C. ANSI/IEEE Std C62.45™ -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
- D. ANSI C84.1, American National Standard for Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)
- E. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1
- F. National Fire Protection Association (NFPA) 70 (N.E.C.) – 2002 - Article 285
- G. ANSI/UL Standards 1449-2006 Listed (UL 1449 Third Edition), UL 1283 Listed, CUL Listed & CE compliant “low-voltage directive.”
- H. IEEE Standard C62.72™ - 2007 – IEEE Guide for the Application of Surge-Protective Devices for Low-Voltage (1000 V or less) AC Power Circuits

1.4 MANUFACTURER QUALIFICATIONS:

- A. All surge suppression devices shall be manufactured by an ISO 9001-2000 certified company normally engaged in the design, development, and manufacture of such equipment, with at least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.
- B. The surge suppressor manufacturer shall provide unlimited free replacement of the entire SPD for all inoperable SPD units during the warranty period.
- C. Subject to compliance with specification requirements, provide products by one of the following:
 - 1. Surge Suppression Incorporated
 - 2. Intermatic, Inc
 - 3. Liebert
 - 4. Advanced Protection Technologies

1.5 SUBMITTALS:

- A. Surge suppression submittals shall include, but shall not be limited to the following items:
- B. Complete schematic data for all suppressors indicating part numbers, conductor sizes, etc.
- C. Dimensioned drawing of each suppressor type indicating mounting arrangement.
- D. Manufacturer's ANSI/UL 1449-2006 Third Edition listing classification page and listing number(s).
- E. Manufacturer's UL 1283 listing classification page and listing number(s).
- F. Certified test data from independent third party NRTL documenting ANSI/IEEE C62.41-2002 performance and the ability of the device to meet or exceed all requirements of this specification. Include complete let-through voltage/measured limiting voltage test data (not Voltage Protection Rating), test graphs, and scope traces for each mode for each product submitted for Category's C, B, A (including Cat A, 2 kV, 67 A, 100 kHz ring wave at both 90 & 270-degree electrical phase angles).
- G. Letter from manufacturer stating products are in strict compliance with the recommendations of IEEE Standard 1100-2005, Clause 8.6.1 and incorporate 10 individual dedicated discrete modes of protection for three-phase Wye systems, including direct line-to-line components. (Reduced-mode variations will not be accepted).
- H. Certificate of declaration that product is CE low voltage directive compliant
- I. Statement of manufacturer's warranty duration and replacement policy.

PART 2 - PRODUCTS

2.1 REQUIREMENTS:

- A. All SPDs shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) & Complimentary Listed to UL 1283 by a Nationally Recognized Testing Laboratory (NRTL) (i.e. CSA, UL, etc)
- B. The Surge Protective Devices (SPDs) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.
- C. The SPD shall be self-restoring and fully automatic.
- D. The SPD shall be tested and listed by an NRTL as a complete assembly to a symmetrical fault current rating greater than or equal to the available fault current at the location of installation at the connected panel, in accordance with NEC Article 285 and shall be marked with the short circuit current rating (SCCR). If the available fault current is unknown, then the SCCR of the SPD shall be 200 kAIC.
- E. Permanently connected devices mounted parallel to the service, and 208/120V sub panels are required.
- F. The SPD shall have a Nominal Discharge Current (I_n) of 20 kA. ((The Nominal Discharge Current Test was designed to establish that the SPD remains functional after 15 surges at various currents (3 kA, 5 kA, 10 kA, and 20 kA) using the test procedure described in ANSI/UL 1449-2006. 20kA is the most severe.))

Fusing:

- 1. The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. This component-level fusing shall be an integral part of the MOV itself and not silver wire (or other) independently laid across each MOV.
- 2. Surge protective devices shall contain integral short circuit current safety fusing within each device for over-current requirements of the NEC. This fusing will be independent of the “component-level” fusing and be specifically for over-current protection and shall be constructed utilizing surge rated, cartridge fuses and not rated ‘silver-fuse-wire’ (or other).
- 3. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters) in combination with or for the protection of the suppression elements is not permitted.
- 4. The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under ANSI/UL 1449-2006 (a.k.a. UL 1449 3rd Edition).

MCOV: The SPD shall have a maximum continuous operating voltage (MCOV) capable of sustaining 115% of nominal RMS voltage continuously without degrading.

Component Limitations: The SPD shall only use solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that “crowbar” short-circuit the AC power system (e.g. spark gaps, gas tubes, selenium cells, or SCR's) shall not be acceptable.

Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound, and be of a parallel design.

Protection Modes: The SPD system shall provide (per IEEE Std. 1100-1999 8.6.1) dedicated, independent, distinct, individual protection circuitry for every possible mode in the electrical distribution system at the point of SPD application. For example, a 277/480V or 120/208V, 3-phase Wye, 4-wire plus ground system has 10 distinct modes that require independent and dedicated protection (i.e., L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G). None of these modes of protection depend on protection elements purposed for other protection modes. Reduced mode SPD with only 3, 4, or 7 dedicated, distinct, independent protection modes are not acceptable. When a mode of protection is specified, the protective mode shall be included. Thus, Line-to-Neutral-to-Line is *not acceptable* where Line-to-Line is Specified.

Status Indicators: SPD units shall have panel front status monitors as a minimum to indicate a continuous positive status of each protected phase. A remote audible alarm option must be supplied where the specifying engineer deems it necessary and cost effective under the circumstances. Refer to the appropriate drawings and schedules for these details.

Equipment Certification: Items shall be listed to ANSI/UL 1449-2006, shall bear the seal of the NRTL, shall bear the Marking "Listed to UL 1449", shall have been tested under ANSI/UL 1449-2006, and shall be marked in accordance with the referenced standard. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly. All surge suppression devices shall be manufactured by an ISO 9001-2001 certified company normally engaged in the design, development, and manufacture of such equipment.

Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, encapsulated, custom parallel connected, and solid state. (Series units or units equipped with "load carrying" components are expressly prohibited due to the possibility of single point series failures causing power interruption to protected loads.)

Enclosures: Unless otherwise noted, provide NEMA 1 or better enclosure for indoor mounting and NEMA 4 enclosure or better for all outdoor locations. All units will contain Form C, N/O or N/C, dry relay contacts, if so specified, and weatherproof fittings to maintain the required NEMA integrity.

Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device (SPD) status are not acceptable. SPD shall require NO routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon failure.

Commonality: All SPDs at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

All SPDs shall meet or exceed the following performance criteria:

Service Entrance (Category C): Service Entrance (Category C): The SPD shall provide a minimum protection of 240kA per phase (three-phase Wye) and be capable of meeting the Category C-High Let-Through Voltage criteria as shown in the Section VII, below.

Branch Panels/Panelboards (Category A): The SPD shall provide a minimum protection of 120kA per phase and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section VII, below.

2.2 ANSI/IEEE C62.41 LET-THROUGH VOLTAGE

- A. The SPD shall meet the Let-Through Voltage requirements shown in the tables below for voltage and locations specified. All voltages shall be peak ($\pm 10\%$) Positive Polarity, Time base = 10 μ S, Sampling Rate = 500ms/s to ensure maximum transient capture. [These settings assure Let-through Voltage test results are accurate]. Surge voltages shall be measured from the insertion of the surge on the sine wave to the peak of the surge. All tests are Static (unpowered), except for the 120V circuits that are Dynamic (powered). Let-through voltages on static tests calculated by subtracting sine wave peak from let-through measured from zero. All tests shall be performed in accordance with UL 1449 Third Edition with measurements performed at a point on the leads 15.24 cm (6 inches) outside of the device enclosure. No data measured at a module, lugs, component, or undefined location will be accepted. These settings assure Let-through Voltage test results are accurate. SPDs shall meet the following criteria:

Service Entrance: (277/480V, 3 Phase 4 Wire)

ANSI/IEEE Cat. C Impulse Wave The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. C Impulse Wave (20kV, 10,000 amps) at the 90 degree phase angle, shall be less than (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

Mode / Voltage	277/480Y
L-N	1075V
L-L	1350V
L-G	1275V
N-G	1585V

Panelboards: (120/208V 3 Phase 4 Wire)

ANSI/IEEE Cat. B Combination Wave Impulse Let-Through Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. B Combination Wave Impulse (6kV, 3000 amps) at the 90-degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

Mode / Voltage	120/208Y
L-N	390V
L-L	580V
L-G	400V
N-G	575V

PART 3 - EXECUTION

3.1 WARRANTY

- A. All SPD devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of ten (10) years from date of substantial completion.
- B. Any SPD device that shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced as a complete unit (not just modules, subassemblies, or components) by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period that starts at the date of substantial completion of the system to which the surge suppressor is installed.
- C. SPD manufacturers whose warranty does not meet the requirements listed above standard shall submit a letter extending the warranty to meet these standards with the product submittal.

3.2 INSTALLATION

- A. Provide surge suppressor at each building service entrance and at other distribution and panelboard locations as indicated on the drawings. The SPD shall be located immediately adjacent to the switchboard or panelboard being protected (close-nipple to panel-boards). The SPD may not be located integral (switchgear manufacturer installed) within the switchboard or panelboard(s) unless the switchgear manufacturer providing such SPD products expressly meets or exceeds ALL parameters of this specification for the SPD. These SPDs shall be individually tested and Listed to ANSI/UL 1449-2006 according to their type and not be listed solely as part of the larger assembly. SPD devices not meeting or exceeding the performance of this specification will be deemed unacceptable.
- B. Do not energize or connect service entrance equipment and panelboards to their sources until TVSS devices are properly installed and connected.
- C. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.
- D. Install the SPD with #10 AWG minimum conductors to dedicated 30-amp breaker(s) in panel per manufacturer's installation instructions and close to the Neutral Bus. The dedicated breaker shall serve as a means of service disconnect for the SPD so that the electrical panel remains energized during SPD servicing. The installer may rearrange breaker locations to ensure the shortest and straightest leads to the SPD. If a dedicated breaker is not provided, an SPD with internal 30-amp fuse or a UL Listed fused disconnect switch shall be installed as a minimum. The conductors serving the SPD shall be twisted together (one twist per 12" of wire) to reduce the SPD system input impedance and shall be kept at the minimum length. The SPD shall be installed in strict accordance with the manufacturer's recommended practices and in compliance with N.E.C. requirements, State, and Local Codes.
- E. Lead lengths shall not exceed 18 inches.
- F. The electrical contractor shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall ensure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor will ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.

- G. The electrical contractor shall furnish all labor, materials, equipment, and services necessary for and incidental to the installation of the SPD system components as specified herein.
- H. The electrical contractor shall coordinate with other electrical work as necessary to interface installation of the transient voltage surge suppression systems with other work on the site.
- I. The SPD installation shall be certified by a licensed electrician that the installation is in accordance with the manufacturer's recommendations, applicable electrical code requirements and the requirements of the specification above. Any deficiencies noted shall be corrected by the Contractor. Provide written documentation of this inspection as part of the closeout documentation.
- J. The Manufacturer or qualified representative shall inspect the final installation and conduct a four-hour scheduled familiarization and maintenance instruction with Administration and Maintenance personnel.

END OF SECTION 264313

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 26 51 00 - INTERIOR LIGHTING

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 lighting fixtures, lamps, and ballasts.
- 2. Emergency lighting units.
- 3. Exit signs.
- 4. Lighting fixture supports.

- B. Related Sections include the following:

- 1. Division 26 Section "Lighting Controls and Devices" for manual or programmable control systems employing low-voltage control wiring or data communication circuits.
- 2. Division 26 Section "Wiring Devices" for manual wall-box dimmers for fluorescent lamps or LED technology.

1.3 DEFINITIONS

- A. BF: Ballast factor.
- B. CRI: Color-rendering index.
- C. CU: Coefficient of utilization.
- D. HID: High-intensity discharge.
- E. LER: Luminaire efficacy rating.
- F. Luminaire: Complete lighting fixture, including ballast/driver housing if provided.
- G. RCR: Room cavity ratio.

- H. SSL: Solid State Lighting (LED)
- I. BUG Rating: Backlight, Uplight, Glare Rating.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Ballast.
 - 4. Energy-efficiency data.
 - 5. Life, output, and energy-efficiency data for lamps.
 - 6. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, drivers, and accessories identical to those indicated for the lighting fixture as applied in this Project.
 - a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
 - b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Wiring Diagrams: Power and control wiring.
- D. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Lighting fixtures.
 - 2. Suspended ceiling components.
 - 3. Structural members to which suspension systems for lighting fixtures will be attached.
 - 4. Other items in finished ceiling including the following:
 - a. Air outlets and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Smoke and fire detectors.
 - e. Occupancy sensors.
 - f. Access panels.
 - g. Perimeter moldings.
 - 5. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.
 - 6. Qualification Data: For agencies providing photometric data for lighting fixtures.
 - 7. Field quality-control test reports.
 - 8. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

9. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NFPA 70.
- E. FMG Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries:
 - 1. Warranty Period for Self-Powered Exit Sign Batteries: 5 years from date of Substantial Completion. Full warranty shall apply for full 5 years, no prorated warranties are permitted.
- B. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Electronic Ballasts: 5 years from date of Substantial Completion.
 - 2. Warranty Period for Electromagnetic Ballasts: 3 years from date of Substantial Completion.
 - 3. Warranty Period: Two year(s) from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 3. Battery and Charger Data: One for each emergency lighting unit.
 - 4. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 5. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
- B. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - 3. Basis-of-Design Product: The design for each lighting fixture is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- C. LED Fixtures: Comply with UL 8750. Test according to Illuminating Engineering Society of North America (IESNA) LM-80 standards.
- D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 6
- E. Metal Parts: Free of burrs and sharp corners and edges.

- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metalized Film: 90 percent.
- I. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
 - b. UV stabilized.

2.3 LED TROFFERS

- A. Description: Led lighting fixtures shall have long life replaceable LEDs (where applicable) coupled with high-efficiency drivers, provide superior quality and quality of illumination for extended service life. Fixture shall be rated to deliver specified performance for 50,000 hours.
- B. Fixtures noted to be dimmable shall have 0-10-volt control. COORDINATE with dimming system.
- C. Fixtures shall provide (degree) K color temperatures as indicated on drawings.
- D. Fixtures shall have a minimum of 5-year warranty
- E. LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
- F. LM-80-08, IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources

2.4 BALLASTS FOR LINEAR FLUORESCENT LAMPS

- A. Electronic Ballasts: Comply with ANSI C82.11; instant start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.

1. Sound Rating: A.
 2. Total Harmonic Distortion Rating: Less than 20 percent.
 3. Transient Voltage Protection: IEEE C62.41, Category A or better.
 4. Operating Frequency: 20 kHz or higher.
 5. Lamp Current Crest Factor: 1.7 or less.
 6. BF: 0.85 or higher, unless otherwise indicated.
 7. Power Factor: 0.95 or higher.
 8. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.
- B. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.
1. Ballast Manufacturer Certification: Indicated by label.
- C. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.
- D. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.
1. Dimming Range: 100 to 5 percent of rated lamp lumens.
 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
 3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.

2.5 BALLASTS FOR COMPACT FLUORESCENT LAMPS

- A. Description: Electronic programmed rapid-start type, complying with ANSI C 82.12, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
1. Lamp end-of-life detection and shutdown circuit.
 2. Automatic lamp starting after lamp replacement.
 3. Sound Rating: A.
 4. Total Harmonic Distortion Rating: Less than 20 percent.
 5. Transient Voltage Protection: IEEE C62.41, Category A or better.
 6. Operating Frequency: 20 kHz or higher.
 7. Lamp Current Crest Factor: 1.7 or less.
 8. BF: 0.95 or higher, unless otherwise indicated.
 9. Power Factor: 0.95 or higher.
 10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
 11. Ballast Case Temperature: 75 deg C, maximum.

2.6 EMERGENCY FLUORESCENT POWER UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
1. Emergency Connection: Operate 1 fluorescent lamp(s) continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 3. Battery: Sealed, maintenance-free, nickel-cadmium type.
 4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 5. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is announced by an integral audible alarm and flashing red LED.

2.7 EMERGENCY LIGHTING UNITS

- A. Description: Self-contained units complying with UL 924.
1. Battery: Sealed, maintenance-free, lead-acid type.
 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
 7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
 8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is announced by an integral audible alarm and flashing red LED.

2.8 EXIT SIGNS

- A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

2.9 COMPACT FLUORESCENT LAMPS

- A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA C78.LL.
- B. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life 20,000 hours, unless otherwise indicated.
- C. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.
- D. T5 programmed-start low-mercury lamps, rated 28 W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.
- E. T5HO programmed-start, high-output low-mercury lamps, rated 54 W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.
- F. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 4100 K, average rated life of 10,000 hours at 3 hours operation per start, and suitable for use with dimming ballasts, unless otherwise indicated.
 - 1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
 - 2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
 - 3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
 - 4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
 - 5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
 - 6. 55 W: T4, triple tube, rated 4300 initial lumens (minimum).

2.10 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 21 Section "Electrical Supports" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.11 REQUIREMENTS FOR INDIVIDUAL LIGHTING FIXTURES

- A. Comply with requirements of Lighting Fixture Schedule on electrical drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.
 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Suspended Lighting Fixture Support:
 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- D. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

- E. Adjust aimable lighting fixtures to provide required light intensities.
- F. Connect wiring according to Division 21 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 27 00 00 - COMMUNICATIONS STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.01 CONTRACTOR QUALIFICATIONS

- A. The Structured Cabling System Contractor shall be an experienced firm regularly engaged in the layout and installation of structured cabling systems of similar size and complexity as required for this installation. The Structured Cabling System Contractor, under the same company name, shall have successfully completed the layout, installation, testing and warranty of not less than five Structured Cabling Systems of the scope of the largest system on this project for a minimum period of three years prior to the bid date, and shall have been regularly engaged in the business of Structured Cabling Systems contracting continuously since. The Structured Cabling System Contractor shall have an existing permanent office located within 100 miles of the job site from which installation and warranty service operations will be performed.
- B. The Structured Cabling System Contractor shall present, with his bid, the name and certification number of a BICSI certified Registered Communications Distribution Designer (RCDD) who is a permanent employee of the Structured Cabling System Contractor. The Structured Cabling System Contractor shall maintain this RCDD, or another RCDD approved by the Architect/Engineer, in his permanent employment throughout this project. The RCDD shall have overall responsibility for certifying that the installed structured cabling system conforms to these contract documents and to the referenced EIA/TIA, IEEE, BICSI, and UL standards. Specific requirements for the RCDD are as follows:
- (1) The RCDD shall be, in the judgment of the Architect/Engineer, thoroughly experienced in the design, layout, and installation of structured cabling systems of similar size and complexity as required for this installation. The RCDD shall submit evidence of these qualifications to the Architect/Engineer upon request.
 - (2) The RCDD shall affix his stamp to the Contractor's pre-installation submittal drawings, indicating that he has reviewed and approved the drawings for conformance to the contract documents and to the referenced codes and standards.
 - (3) The RCDD shall periodically visit the site and inspect the work in progress. RCDD site visits shall be made not less than once per month when the job is in active progress. The RCDD shall prepare a field report for each site visit for submission to the Architect/Engineer.
 - (4) The RCDD shall sign off on all copper and fiber optic cable test results, indicating that he was in responsible charge of all cable testing procedures and that all cables were tested in compliance with the contract documents and met or exceeded the

requirements stated therein.

- (5) The RCDD shall affix his stamp to the Contractor's as-built drawings, indicating that he has reviewed and approved the drawings as being complete, accurate, and representative of the system as actually installed.

1.02 PROOF OF CONTRACTOR QUALIFICATIONS

- A. The Structured Cabling System Contractor shall provide the following documentation, to be presented with his bid, as evidence that the requirements for Structured Cabling System Contractor qualifications listed above are satisfied. If the bidder does not meet the requirements of this specification section for structured cabling system work, he shall provide the following documentation, to be presented with the bid, as evidence that the requirements listed above are satisfied by the Structured Cabling System Contractor he proposes to use as a subcontractor to perform work under this section. In either case, all work under this section shall be performed by permanent employees of the Structured Cabling System Contractor listed on the bid form, and shall not be performed by another subcontractor, employees of another company, or by temporary employees.
 - (1) Provide a list of not less than five (5) references for jobs of similar size and complexity including project name, location, contact person and phone number.
 - (2) Provide RCDD name, BICSI certification number, and qualifications.
 - (3) Provide location of existing permanent office from which installation and warranty work will be performed.
 - (4) Provide copies of certificates issued by Structured Cabling System Manufacturer proving that the Structured Cabling System Contractor is in good standing with the manufacturer as a Certified Installer, and that the Structured Cabling System Contractor can offer the Owner a 20 year system warranty in partnership with the Structured Cabling System Manufacturer.

1.03 DESCRIPTION OF WORK

- A. The work consists of all labor, materials, equipment and services necessary to provide, install, test and certify all systems as described in the contract documents. The Structured Cabling System Contractor shall provide systems complete and ready for operation. The installation shall include all accessories and appurtenances required to provide a complete and operational system. Any materials not specifically mentioned in these specifications or not shown on the drawings, but required for a complete and finished installation shall be furnished and installed at no additional cost to the Owner.

1.04 SCHEDULING:

- A. The Structured Cabling System Contractor shall become thoroughly familiar with the overall project schedule, and shall complete his work and make all systems fully operational prior to the date of occupancy of the facilities by the Owner.

- B. The Structured Cabling System Contractor shall coordinate all work with the General Contractor and the Electrical Contractor, as well as all other trades.

1.05 EXAMINATION OF SITES AND TOTAL SYSTEM RESPONSIBILITY

- A. Prior to providing a proposal for this work, the Contractor shall visit the proposed site of work to become familiar with any condition that may affect the work to be performed in any way. No allowances shall be made because of lack of knowledge of these conditions.
 - (1) The Contractor shall have total system responsibility to assure a fully operational system. Any additional labor and components required for the installation of complete operating systems but not specifically required by the bid documents shall be provided and the cost borne by the Contractor.
 - (2) The Contractor shall remain the sole owner of the system and all of its components provided under this contract and is responsible for all risk of loss or damage of the system for the entire contract period up to and including the date and time of Final Acceptance by the Architect/Engineer and the Owner's Project Manager. After the date of Final Acceptance, the Owner shall assume full ownership of the system with all components, and the warranty period shall commence.

1.06 QUALITY ASSURANCE

- A. Materials shall be new and shall be the best of their respective kinds. All work shall be accomplished in a workmanlike manner in keeping with the best practices and highest standards of the telecommunications industry.
- B. Protect materials and equipment from physical or environmental damage during shipping, storage and installation. Equipment and materials shall be received at the site in new condition and shall be maintained in new condition throughout the installation process. Damaged or deteriorated equipment and materials will not be acceptable. The Contractor shall be responsible for the safety and condition of all materials and equipment, whether stored or installed, until Final Acceptance by the Architect/Engineer and the Owner.

1.07 CODES AND STANDARDS

All work done under this contract shall be performed in accordance with the most recent issue of the following codes, standards and guidelines. Where there is a perceived conflict between a standard or guideline and the contract documents, the Contractor shall perform the work as directed by the Architect/Engineer.

NFPA 70	National Electrical Code - 2014 Edition
NFPA 101	Life Safety Code - 2015 Edition
FBC	Florida Building Code - 2017 Edition
TIA/EIA	Telecommunications Industry Association/Electronic Industries Association

TIA/EIA-526-14A	OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant - August 1998
TIA/EIA-568-B.1	Commercial Building Telecommunications Cabling Standard Part 1: General Requirements - May 2001
TIA/EIA-568-B.1-1	Addendum 1 – Minimum 4-Pair UTP and 4-Pair ScTP Patch Cable Bend Radius - August 2001
TIA/EIA-568-B.2	Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components - May 2001
TIA/EIA-568-B.2-1	Addendum 1 – Transmission Performance Specifications for 4-pair 100 Ω Category 6 Cabling - June 2002
TIA/EIA-568-B.2-2	Addendum 2 – Balanced Twisted Pair Cabling Components - December 2001
TIA/EIA-568-B.2-3	Addendum 3 – Additional Considerations for Insertion Loss and Return Loss Pass/Fail Determination - March 2002
TIA/EIA-568-B.2-4	Addendum 4 – Solderless Connection Reliability Requirements for Copper Connecting Hardware - June 2002
TIA/EIA-568-B.3	Optical Fiber Cabling Components Standard- April 2000
TIA/EIA-569-A	Commercial Building Standard for Telecommunications Pathways and Spaces – February 1998
TIA/EIA-598-B	Optical Fiber Cable Color Coding - December 2001
TIA/EIA-606-A	Administration Standard for Commercial Telecommunications Infrastructure - May 2002
TIA/EIA-607	Commercial Building Grounding and Bonding Requirements for Telecommunications - August 1994
TIA/EIA-758	Customer-Owned Outside Plant Telecommunications Cabling Standard - April 1999
IEEE	Institute of Electrical and Electronics Engineers
BICSI	Building Industry Consulting Service International
	Telecommunications Distribution Methods Manual (TDMM) (9th Edition, 2000)
	Network Design Reference Manual (NDR) (5th Edition, 2003)

Customer-Owned Outside Plant (CO-OSP) Design Manual (2nd Edition, 2001)

Telecommunications Cabling Installation Manual (TCIM) (3rd Edition, 2001)

1.08 PRE-INSTALLATION SUBMITTALS

A. MANUFACTURER'S CATALOG DATA:

Submit five (5) copies of manufacturer's standard descriptive data sheets to the Architect/Engineer for review and approval prior to commencing work. Furnish complete data sheets bearing the printed logo or trademark of the manufacturer for each type of product being provided. Mark each copy of the data sheets for the specific product being provided with an identifying mark, arrow, or highlighting. The following items shall be submitted:

- Racks, Related Hardware & Accessories, each type
- Enclosures and Cabinets, each type
- Copper Patch Panels, each type
- Category 6 UTP Cable, each type
- Cable End Connectors, each type
- Patch Cables - Copper and Fiber Optic, each type
- Wire Management Devices, each type
- Communications Outlets (CO), each type
- Grounding Busbars and Lugs, each type
- Firestopping Systems, each type
- Labeling Products, each type

B. PRE-INSTALLATION DRAWINGS:

As part of the Structured Cabling System installation, the Contractor shall provide detailed documentation to facilitate system administration, maintenance, and future moves, adds and changes. Drawings shall be provided which incorporate all information in the Contract Drawings, and which fully document any and all Architect/Engineer approved changes in materials and methods made by the Contractor. Drawings are not required if no changes to the design are made by the Contractor. Changes to the design shall not be made without the prior written approval of the Architect/Engineer. Drawings shall provide the same level of detail as the bid documents.

Submit five (5) copies of pre-installation drawings to the Architect/Engineer for review and approval prior to commencing work.

1.09 CONTRACTOR'S RECORD DOCUMENTS

The Structured Cabling System Contractor shall maintain a full set of contract documents at the job site at all times, consisting of specifications, drawings, addenda, pre-installation submittals, change orders, and change directives. The record documents shall be updated by the Contractor, in red pen and on a daily basis. The record documents shall be clearly marked "Record Set", shall

be kept in a protected location, and shall not be used for general construction purposes. The record documents shall be provided to the Architect/Engineer at the close of the project.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials, equipment, and devices shall be new and unused, of current manufacture and of the highest grade, free from defects.
- B. All products shall be the manufacturer and model or part number specified. Where a model or part number is indicated in error for any reason, the Contractor shall verify the intent of the Architect/Engineer prior to providing a proposal, and shall provide the product intended by the Architect/Engineer. Where a manufacturer has updated or improved a product subsequent to issuance of the bid documents by the Architect/Engineer, the Contractor shall provide the updated or improved product at no additional cost to the Owner
- C. Provide new equipment and materials only. Each component shall be the most recent model number, revision, or update offered by the manufacturer at the time of purchase by the Contractor. Newly manufactured containing used or rebuilt parts, remanufactured, rebuilt, reconditioned, used, shopworn, demonstrator or prototype equipment is not acceptable and will be rejected.
- D. All materials and equipment shall be a standard catalogued product of a manufacturer regularly engaged in the manufacture of similar products.

2.02 PRODUCT SPECIFICATIONS

- A. See drawings for all product requirements not indicated in these specifications. The Structured Cabling Contractor shall be responsible for providing and installing all components indicated in these specifications and on the drawings, unless specifically indicated to be provided by others.
- B. Structured Cabling System: Provide all system components as indicated the drawings. To insure a uniform basis for bidding, and to standardize the Owner's facilities, base all bids on the particular systems, equipment and materials specified.

PART 3 - EXECUTION

3.01 GENERAL

The installation shall be in strict accordance with all applicable codes and standards, the respective manufacturer's written recommendations, and the contract drawings and these specifications.

Workmanship shall be of the highest grade in accordance with the best modern practice and the

highest standards of the telecommunications industry.

The installed system shall be neat, clean, and well organized in appearance. Provide working clearances for normal system operation, reconfiguration and repair.

The completed installation shall meet with the approval of the Owner's Project Manager and the Architect/Engineer.

The General Contractor and the Structured Cabling System Contractor shall share full responsibility for protecting all communications outlets, the CC, all existing CCs and communications spaces and facilities and all structured cabling system components from dust and debris during construction and until final completion of the project. The SCS shall not install racks, wire managers, patch panels, protector blocks, 66 blocks, or dress out and terminate cables until paint, backboards and tile floors in the CC are completely finished and those rooms are completely isolated from dust infiltration with plastic sheeting and duct tape. All COs jacks shall be protected by bagging and sealing dust tight at all times after connectivity devices are installed. All system components that, in the sole judgment of the Engineer, are exposed to excessive accumulation of construction dust/debris at any stage of the project shall be removed and replaced with new components at no additional cost to the Owner.

A. DELIVERY:

Protect materials and equipment from physical or environmental damage during shipping, storage and installation. Equipment and materials shall be received at the site in new condition in original factory sealed cartons, and shall be maintained in new condition throughout the installation process. Damaged or deteriorated equipment and materials will not be acceptable. The Contractor shall be responsible for receiving and storing of all equipment and materials, and shall be responsible for the safety and condition of all materials and equipment, whether stored or installed, until Final Acceptance by the Architect/Engineer and the Owner.

B. DATA EQUIPMENT:

- (1) Provide a system of data cabling to serve the communications outlets indicated on the drawings. Provide and properly mount all data equipment in racks as indicated on the drawings.
- (2) Provide copper patch cords to interconnect data equipment and to connect data equipment to horizontal wiring connections as specified herein.

C. CONDUIT INSTALLATION:

- (1) All conduit shall be installed by a licensed electrical contractor using tradesmen who are skilled and experienced in the types of conduit installations indicated in the bid documents.
- (2) Conduit shall be installed with top-grade workmanship, using factory bends or field bends made with the proper tools. Kinked, dented or otherwise improperly constructed bends will not be accepted. All bends shall have a minimum radius of six times the internal conduit diameter.

- (3) The Contractor shall provide all conduit sleeves required for a complete installation and where required to penetrate fire rated partitions masonry walls and floors, regardless of whether those sleeves are indicated on the drawings or not, and at no additional cost to the Owner.
- (4) All aboveground outdoor conduit, including the penetration of exterior walls, shall be galvanized rigid with watertight galvanized rigid threaded fittings. All rigid conduit in contact with earth shall be factory coated. All buried conduit shall be Schedule 40 electrical grade PVC conduit. All PVC conduit joints shall be cleaned and glued for a water tight connection.
- (5) Firestop all conduit penetrations of all walls that extend to the underside of the floor or roof deck above. Accomplish firestopping using UL classified systems with fire rating equal to or greater than the fire rating of the floor or wall assembly penetrated. Firestop systems shall be 3M, Nelson or Architect/Engineer approved equal. Install in strict accordance with the manufacturer's printed instructions and the conditions of the UL approval for each firestop system used.

D. CABLING INSTALLATION:

- (1) All horizontal and backbone cabling shall be installed continuously in conduit. All backbone cabling shall be run continuously in conduit. Do not pull cables in conduits until plastic insulating bushings have been installed. Cables installed in conduits without plastic insulating bushings shall be removed and replaced with new cables. Rack conduits and run together wherever possible.
- (2) Provide wire management devices on backboards and racks and as required to facilitate organized routing of cables and patch cords. Bundle cables together behind racks and fan out to points of termination. The finished installation shall meet the approval of the Architect/Engineer for overall quality and neatness of appearance.

E. IDENTIFICATION AND LABELING:

- (1) The Structured Cabling System Contractor shall purchase and use labeling software and labeling products to generate all labels for this project, with the exception of engraved plastic tags and laminated paper tags, which shall be fabricated as indicated on the drawings, and elsewhere as indicated below.
- (2) All labels shall be produced using a laser printer and shall be clear and easily readable. Minimum text size shall be 12 point. Text font shall be ARIAL. Handwritten labels are not acceptable.
- (3) Label each horizontal cable and backbone cable using self-adhesive self-laminating polyester wrap-around labels with laser printed text as follows:

3.1.5.3.1 Label each Horizontal Category 6 cable at each end. Label text shall be based on the nomenclature indicated on the drawings.

3.1.5.3.2 Label each Fiber Optic Backbone Cable at each end. Label text shall be based on the nomenclature indicated on the drawings.

- (4) Label each Communications Outlet using non-adhesive card labels with laser printed text. Insert labels under outlet manufacturer's plastic label covers centered and straight. Label text shall be based on the 'CO Identification Nomenclature' indicated on the drawings.
- (5) Label each Category 6 Horizontal Patch Panel port using self-adhesive labels. The Contractor shall first attach the adhesive labels to the perforated paper labels supplied by the patch panel manufacturer, then insert the paper labels into the plastic covered icon-label holders supplied by the patch panel manufacturer. Label text for each patch panel port shall be based on the 'Horizontal Patch Panel Labeling Nomenclature' indicated on the drawings.
- (6) Label each Backbone Fiber Optic Cable Drawer with 1" high bold text printed on clear self-adhesive paper and attached to the reverse side of drawer manufacturer's paper label. Label text shall be based on the 'Fiber Optic Backbone Cable Nomenclature' indicated on the drawings to indicate source (CER) and each destination (CC).
- (7) Label each Rack, Enclosure/Cabinet, Voice Protector Block, Voice Backbone Patch Panel and other devices as indicated on the drawings.

3.02 CABLE TESTING

A. GENERAL:

- (1) Prior to installation of cabling, visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport. Return visibly damaged goods to the supplier and replace with new.
- (2) If post-manufacture performance data has been supplied by the manufacturer of cables or connecting hardware, copies of such data are to be kept for inclusion in the Documentation and made available to the Owner upon request.
- (3) After cabling installation and labeling is complete, but prior to the installation of patch cords, the Contractor shall test all cables. As part of cable test procedures verify all labeling and correct all inaccurate labeling.
- (4) The Contractor's RCDD shall be in responsible charge of all cable testing procedures and shall provide an original signed letter in each project Operation & Maintenance (O&M) manual certifying that all cables have been tested in compliance with the contract documents and have met or exceeded the requirements stated therein.
- (5) Tests shall be performed in strict accordance with the test instrument manufacturer's printed instructions.
- (6) One hundred percent of all cables shall be tested.

- (7) Technicians performing testing shall be thoroughly trained in the use of the test instruments employed. Factory certification of technicians is mandatory. The Contractor shall provide evidence of training and copies of certificates to the Architect/Engineer.
- (8) The Contractor is responsible for supplying all test equipment and related materials required to test the entire Structured Cabling System. Test instruments shall be calibrated and traceable to the National Institute of Standards (NIST). Test instruments shall have been recently calibrated. The Contractor shall provide evidence of test instrument calibration if requested by the Architect/Engineer.
- (9) The requirement for this project is full compliance/zero tolerance. Cables that do not comply with the stated standards shall be removed and replaced with new. Partial use of cables by claiming good pairs or strands and abandoning others is not allowable. Defective cables shall be removed and replaced with new.
- (10) Notify the Owner in writing not less than five days prior to commencing cable testing. The Owner may elect to be present for and witness cable testing.

B. CABLE TEST RESULTS:

All cable test results shall be provided as part of the project Installation and Maintenance (O&M) Manuals.

C. PATCH CORD INSTALLATION:

- (1) Prior to Equipment Verification, the contractor shall install patch cords in a neat and workmanlike manner using the wire management devices indicated on the drawings.
- (2) The signature of the Owner's Project Manager does not indicate acceptance of ownership of the patch cords by the Owner. Ownership of patch cords shall be transferred to the Owner at the same time as the project as a whole.
- (3) Following verification of patch cords types, quantities and lengths by the Owner's Project Manager, the contractor shall complete the patch cord installations as follows:

D. DATA COPPER PATCH CORDS – CC:

- (1) Install data patch cords connecting each port of all data equipment from data equipment connections to horizontal patch panels.
- (2) Provide a typed cross-reference list in Microsoft Excel spreadsheet format identifying data equipment ports and corresponding horizontal wiring connections – place hardcopy and CD of spreadsheet in three ring binder and mount binder on the backboard adjacent to the racks. Provide additional hardcopy and CD in O&M Manuals. Email copy of Excel Spreadsheet to the

Architect/Engineer and the Owner's Project Manager.

- (3) Patch cords shall be neatly routed and bundled with black velcro at 6 inches on center in wire management devices from connection to connection. Patch cord lengths shall be selected by the Contractor from the stock supplied under the project to provide a neat installation in the racks and wire management systems without excess length. Note - Bundle data patch cords together – do not mix data patch cord bundles with voice patch cord bundles or fiber optic patch cord bundles. The entire installation shall require the site approval of the Architect/Engineer.

3.03 EQUIPMENT VERIFICATION

After installation of patch cords and before System Startup, the Contractor shall assist the Owner to power-up all data equipment and verify proper operation. The Contractor shall coordinate with the Owner to verify all cable interfaces are working and operational with the equipment.

3.04 SYSTEM STARTUP

After Equipment Verification and before Final Checkout, the Contractor shall start the systems up, and in coordination with the Owner make them fully operational. The System Startup shall be made at a time, approved in writing by owner, during normal business hours.

3.05 FINAL CHECKOUT

After System Startup and before the First Day of operation following System Startup, the Contractor shall perform a Final Checkout of all systems to verify that each is ready for use by Owner personnel. The Contractor shall utilize a Final Checklist to fully document Final Checkout. Provide a copy of the Final Checklist to the Architect/Engineer at the Final Inspection.

3.06 FIRST DAY OF OWNER OPERATION

The Contractor shall have a senior technician present at the site for the first full 8 hour day of operation following the Final Checkout to train/assist Owner personnel and to verify/fine tune system operation. The senior technician shall make follow-up visits as required to bring the system into full operating condition to the satisfaction of the Owner's Project Manager and the Architect/Engineer.

3.07 FINAL CLEANUP

The General Contractor and the Structured Cabling System Contractor shall share full responsibility for protecting all communications outlets, the CER, all existing CCs and communications spaces and facilities and all structured cabling system components from dust and debris during construction and until final completion of the project. The SCS shall not install racks, wire managers, patch panels, protector blocks, 66 blocks, or dress out and terminate cables until paint, backboards and tile floors in the CER are completely finished and those rooms are completely isolated from dust infiltration with plastic sheeting and duct tape. All COs jacks shall be protected by bagging and sealing dust tight at all times after connectivity devices are installed. All system components that, in the sole judgment of the Engineer, are exposed to excessive accumulation of construction dust/debris at any stage of the project shall be removed and replaced

with new components at no additional cost to the Owner

Prior to the Substantial Completion Inspection, perform final cleanup of all work and all areas in which work was performed. All work areas shall be left vacuum clean. All raceway, faceplates, jack assemblies, racks, panels, data equipment, and the like shall be thoroughly wiped down to remove small amounts of dust accumulated during the course of the project. Jacks, patch panels, wiring blocks and data, voice and ITV equipment shall be cleaned with a high powered vacuum cleaner to completely remove internal dust. All painted surfaces such as backboards shall be touched up with paint to remove scuff marks, pencil marks, scratches, etc. All factory surfaces shall be touched with matching paint.

3.08 CLOSE-OUT DOCUMENTATION

A. OPERATION & MAINTENANCE MANUALS:

- (1) Provide O&M Manuals as required by the architectural specifications and as follows.
- (2) The O&M Manuals shall contain sufficient information to permit Owner personnel to operate the system with or without assistance from the Contractor.
- (3) The Contractor shall provide O&M Manuals covering all equipment and materials furnished under this contract. The O&M Manuals shall contain all information necessary for the operation, maintenance, parts procurement, and parts replacement for the structured cabling system. The information shall include detailed documentation for firmware configuration.

B. AS-BUILT AUTOCAD DRAWINGS:

- (1) Provide the same AutoCAD drawings as required under paragraph "Pre-Installation AutoCAD Drawings". Modify and correct to accurately reflect the finished installation. Provide five (5) hard-copies and two (2) sets of electronic media.
- (2) Submit As-Built AutoCAD Drawings to the Architect/Engineer at the Substantial Completion Inspection. Provide transmittal letter addressed to the Architect/Engineer indicating that the Contractor is providing five (5) hard-copies and two (2) sets of electronic media of the As-Built AutoCAD Drawings.

C. RED-LINE RECORD DOCUMENTS:

- (1) Refer to paragraph "CONTRACTOR'S RECORD DOCUMENTS". Provide Record Documents, updated in red pen, to accurately reflect the finished installation.
- (2) Submit Red-Line Record Documents over to the Architect/Engineer at the Substantial Completion Inspection. Provide transmittal letter addressed to the Architect/Engineer indicating that the Contractor is providing one (1) set of Red-Line Record Documents.

D. ANNOTATED ADOBE *.PDF A-BUILT DRAWINGS:

The Architect/Engineer will provide a full set of Adobe Acrobat *.PDF format As-Built Drawings to the Contractor. The Contractor shall be required to annotate (redline) the *.PDF format drawings using Adobe Acrobat to reflect all changes recorded in the field as required by the paragraph "CONTRACTOR'S RECORD DOCUMENTS". The Contractor shall provide a copy of the *.PDF files on CD with each set of O&M Manuals and shall provide an additional copy on CD to the Architect/Engineer. The Contractor shall also provide 11"x17" hardcopy laser prints of *.PDF drawings in each O&M Manual.

3.09 SUBSTANTIAL COMPLETION

Complete Final Checkout of system operation, Final Checklist, Cable Test Results, O&M Manuals and Record Documents prior to Substantial Completion. The Contractor's project manager and project senior technician shall be present for the Substantial Completion Inspection.

3.010 FINAL COMPLETION

Following completion of punch list items generated by the Architect/Engineer following the Substantial Completion Inspection, the Contractor shall notify the Architect/Engineer in writing, stating that all punch list items have been completed.

3.011 WARRANTY

The Structured Cabling System Contractor warrants all work performed by him directly and all work performed for him by others for a period of three years. Any work, material or equipment which during the warranty period is, in the opinion of the Architect/Engineer or the Owner's Project Manager, defective or inferior and not in accordance with the contract documents, shall be made good at no additional cost to the Owner, including any other work which may have been damaged because of such deficiencies. The Contractor shall be the contact person and the person responsible for coordinating all warranty work for the Owner.

When equipment cannot be repaired at the site, the Contractor shall be completely and solely responsible for the coordination and completion of equipment repairs, including pickup at the project site, transportation and shipping costs to and from the repair site, and reinstallation and reintegration into the system. Equal or better loaner equipment shall be provided and installed by the Contractor any time equipment cannot be repaired at the site, so that the system is maintained in continuous working order as before the equipment failed.

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**PANAMA CITY TERMINAL EXPANSION
PANAMA CITY, FL
BID DOCUMENTS
JANUARY 29, 2019**

SECTION 28 31 00 - FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panels (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- C. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (EST-III).
- D. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- E. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.
- F. The installing fire alarm contractor must maintain an office within 50 miles of the installation site.

1.2 SCOPE

- A. A new intelligent reporting, microprocessor-controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance:
 - 1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
 - 2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
 - 3. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

C. BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The system alarm LED on the system display shall flash.
2. A local piezo electric signal in the control panel shall sound.
3. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. History storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

1.3 SUBMITTALS

A. General:

1. Five copies of all submittals shall be submitted to the Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site

shall not exceed 4 hours.

2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

E. Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.4 GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid.

1.5 APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

A. National Fire Protection Association (NFPA):

No. 72 National Fire Alarm Code
No. 101 Life Safety Code

B. Underwriters Laboratories Inc. (UL):

No. 268 Smoke Detectors for Fire Protective Signaling Systems
No. 86 Control Units for Fire Protective Signaling Systems
No. 268A Smoke Detectors for Duct Applications
No. 521 Heat Detectors for Fire Protective Signaling Systems
No. 464 Audible Signaling Appliances
No. 38 Manually Actuated Signaling Boxes
No. 346 Waterflow Indicators for Fire Protective Signaling Systems
No. 1971 Visual Notification Appliances

C. Local and State Building Codes.

D. All requirements of the Authority Having Jurisdiction (AHJ).

1.6 APPROVALS:

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies: UL - Underwriters Laboratories Inc

- B. The fire alarm control panel shall meet UL Standard 864 Ninth Edition (Control Units)

1.7 APPROVED MANUFACTURERS:

- A. Edwards System Technologies (Est-III)

1.8 APPROVED INSTALLATION CONTRACTOR:

- A. IVANCO, Ft. Walton Beach, FL

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL:

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.
- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT AND WIRE:

- A. Conduit:
 - 1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
 - 2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
 - 3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-55.
 - 4. Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without

interference or loss of signals.

5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. New conduit shall be 3/4-inch (19.1 mm) minimum except 120 volt AC may be run in 1/2 inch conduit. Where available, existing conduits may be used.

B. Wire:

1. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
2. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
3. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
4. Wiring used for the multiplex communication circuit (SLC) shall be twisted and unshielded and support a minimum wiring distance of 12,500 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
5. All field wiring shall be electrically supervised for open circuit and ground fault.
6. The fire alarm control panel shall be capable of t-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs). Systems that do not allow or have restrictions in, for example, the amount of t-taps, length of t-taps etc., are not acceptable.

C. Terminal Boxes, Junction Boxes and Cabinets: All boxes and cabinets shall be UL listed for their use and purpose.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

2.3 FIRE ALARM CONTROL PANEL (One Required):

A. FACP or network node shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system-controlled devices.

B. Operator Control

1. Acknowledge Switch:
 - a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple

alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition.

- b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
2. Alarm Silence Switch:
Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
3. Alarm Activate (Drill) Switch:
The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
4. System Reset Switch:
Activation of the System Reset switch shall cause all electronically-latched Initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
5. Lamp Test:
The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

C. System Capacity and General Operation

1. The control panel or each network node shall provide or be capable of 318 intelligent/addressable devices.
2. The control panel or each network node shall include Form-C alarm, trouble, supervisory, and security relays rated at a minimum of 2.0 amps @ 30 VDC.
3. It shall also include four Class B (NFPA Style Y) or Class A (NFPA Style Z) programmable Notification Appliance Circuits.
4. The Notification Appliance Circuits shall be programmable to Synchronize with System Sensor, Gentex and Wheelock Notification Appliances.
5. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color-coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire alarm system.
6. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
7. The system shall allow the programming of any input to activate any output or group of outputs. Systems that have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes.
8. The FACP shall support up to 20 logic equations, including "and," "or," and "not," or time delay equations to be used for advanced programming. Logic equations shall require the use of a PC with a software utility designed for programming.
9. The FACP or each network node shall provide the following features:
 - a. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
 - b. Detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.

- c. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
 - d. Nine sensitivity levels for alarm, selected by detector. The alarm level range shall be .5 to 2.35 percent per foot for photoelectric detectors and 0.5 to 2.5 percent per foot for ionization detectors. The system shall also support sensitive advanced detection laser detectors with an alarm level range of .03 percent per foot to 1.0 percent per foot. The system shall also include up to nine levels of Prealarm, selected by detector, to indicate impending alarms to maintenance personnel.
 - e. The ability to display or print system reports.
 - f. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.
 - g. PAS presignal, meeting NFPA 72 3-8.3 requirements.
 - h. Rapid manual station reporting (under 3 seconds) and shall meet NFPA 72 Chapter 1 requirements for activation of notification circuits within 10 seconds of initiating device activation.
 - i. Periodic detector test, conducted automatically by the software.
 - j. Self-optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.
 - k. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
 - l. Walk test, with a check for two detectors set to same address.
 - m. Control-by-time for non-fire operations, with holiday schedules.
 - n. Day/night automatic adjustment of detector sensitivity.
 - o. Device blink control for sleeping areas.
10. The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Panel notification circuits (NAC 1,2,3 and 4) shall also support Two-Stage operation, Canadian Dual Stage (3 minutes) and Canadian Dual Stage (5 minutes). Two stage operation shall allow 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates. Canadian Dual stage is the same as Two-Stage except will only switch to second stage by activation of Drill Switch 3 or 5-minute timer. The panel shall also provide a coding option that will synchronize specific strobe lights designed to accept a specific "sync pulse."
11. Network Communication
The FACP shall be capable of communicating on a Fiber Optic Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol.

D. Central Microprocessor

- 1. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, Flash memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
- 2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory and shall not be lost even

- if system primary and secondary power failure occurs.
3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.
 4. A special program check function shall be provided to detect common operator errors.
 5. An auto-program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
 6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download and have the ability to upgrade the manufacturers (FLASH) system code changes. This program shall also have a verification utility, which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in compliance with the NFPA 72 requirements for testing after system modification.

E. System Display

1. The system shall support an 80-character display. The display shall include an 80-character backlit alphanumeric Liquid Crystal Display (LCD) and a full PC style QWERTY keypad.
2. The display shall provide all the controls and indicators used by the system operator:
 - a. The 80-character display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, ALARM ACTIVATE (drill), SYSTEM RESET, and LAMP TEST.
3. The display shall annunciate status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.
4. The display shall also provide Light-Emitting Diodes.
 - a. The 80-character display shall provide 12 Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM WARNING, SECURITY ALARM, SUPERVISORY SIGNAL, SYSTEM TROUBLE, DISABLED POINTS, ALARM SILENCED, Controls Active, Pre-Discharge, Discharge and Abort.
5. The display shall provide a QWERTY type keypad
 - a. The 80-character display keypad shall be an easy to use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
6. The system shall support the display of battery charging current and voltage on the 80-character LCD display.

F. Signaling Line Circuits (SLC)

1. Each FACP or FACP network node shall support one SLC. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric or thermal) and 159 intelligent modules (monitor or control) for a loop capacity of 318 devices. SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.
2. CPU shall receive analog information from all intelligent detectors to be processed to

determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

G. Serial Interfaces

1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Information Technology Equipment (ITE) peripherals.
 - a. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

H. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right or left-hand hinging.

I. Power Supply:

1. A high tech off-line switching power supply shall be available for the fire alarm control panel or network node and provide 6.0 amps of available power for the control panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger for use with batteries up to 55 AH or may be used with an external battery and charger system. Battery arrangement may be configured in the field.
4. The power supply shall continuously monitor all field wires for earth ground conditions, and shall have the following LED indicators:
 - Ground Fault LED
 - AC Power Fail LED
 - NAC on LED (4)
5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
6. The main power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge and be capable of charging batteries up to 200 AH.
7. All circuits shall be power-limited, per UL864 requirements.

J. Auxiliary Field Power Supply - Addressable

1. The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24VDC power. The power

- supply shall also include and charge backup batteries.
2. The addressable power supply for the fire alarm system shall provide up a minimum of 6.0 amps of 24-volt DC regulated power for Notification Appliance Circuit (NAC) power or 5 amps of 24 volt DC general power. The power supply shall have an additional .5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 7.0 - 25.0 amp hour batteries.
 3. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as two Class "A" and two Class "B" or four Class "B" only circuits. All circuits shall be power-limited per UL 864 requirements.
 4. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
 5. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
 6. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire. Data on the SLC shall be transmitted between 24 VDC, 5 VDC and 0 VDC at approximately 3.33k baud.
 7. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
 8. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of eight or sixteen hours shall be Dip-switch selected.
 9. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be Dip-switch selectable.
 10. The addressable power supply mounts in either the FACP backbox or it's own dedicated surface mounted backbox with cover.
 11. Each of the power supply's four output circuits shall be DIP-switch selected for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
 12. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of an end-of-line resistor. When the power supply's output circuit is selected as General 24VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
 13. When selected for Notification Appliance Circuits, the output circuits shall be individually DIP-switch selectable for Steady, March Time, Dual Stage or Temporal.
 14. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
 15. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
 16. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

K. Specific System Operations

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
3. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
4. Point Read: The system shall be able to display or print the following point status diagnostic functions:
 - a. Device status
 - b. Device type
 - c. Custom device label
 - d. View analog detector values
 - e. Device zone assignments
 - f. All program parameters
5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.
7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.
9. Software Zones: The FACP shall provide 100 software zones, 10 additional special function zones, 10 releasing zones, and 20 logic zones.
10. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without

returning to the panel to reset the system. Operation shall be as follows:

- a. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.
 - b. Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.
 - c. All devices tested in walk test shall be recorded in the history buffer.
11. Waterflow Operation
An alarm from a waterflow detection device shall activate the appropriate alarm message on the main panel display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.
 12. Supervisory Operation
An alarm from a supervisory device shall cause the appropriate indication on the system display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
 13. Signal Silence Operation
The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.
 14. Non-Alarm Input Operation
Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.
 15. Combo Zone
A special type code shall be available to allow waterflow and supervisory devices to share a common addressable module. Waterflow devices shall be wired in parallel, supervisory devices in series.

2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices – General

1. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
2. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute.
3. Detectors shall be intelligent (analog) and addressable and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.

7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications.
8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
11. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
12. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
13. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

B. Addressable Manual Fire Alarm Box (manual station)

1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

C. Intelligent Multi Criteria Acclimating Detector

1. The intelligent multi criteria Acclimate detector shall be an addressable device that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine it's environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.
2. The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).
3. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react

hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.

D. Intelligent Thermal Detectors

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

E. Intelligent Duct Smoke Detector

1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

F. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
2. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4-inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

G. Addressable Relay Module

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

2.6 BATTERIES:

- A. The battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
- B. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

- C. If necessary to meet standby requirements, external battery and charger systems may be used.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST: The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

- A. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- B. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- C. Verify activation of all waterflow switches.
- D. Open initiating device circuits and verify that the trouble signal actuates.
- E. Open and short signaling line circuits and verify that the trouble signal actuates.
- F. Open and short notification appliance circuits and verify that trouble signal actuates.
- G. Ground all circuits and verify response of trouble signals.
- H. Check presence and audibility of tone at all alarm notification devices.
- I. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
- J. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

- K. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION:

- A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION:

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION 283100