135

PROJECT MANUAL

NCDOT

Main K3807: Randolph County
Rest Area | Visitor Center

Interstate Highway 73 / 74
Randolph County, NC

T.I.P. # K-3807
WBS # 37331.3.1
F.A. Project # NHF # IMS-73 (12)

North Carolina Department of Transportation
Roadside Environmental Unit
1557 Mail Service Center
Raleigh, NC 27699-1557

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NCDOT Rest Area | Visitor Center
Randolph County, NC

CLIENT

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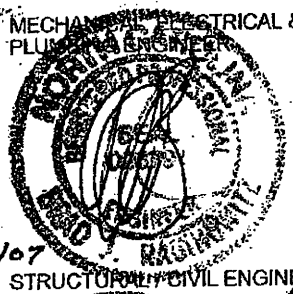

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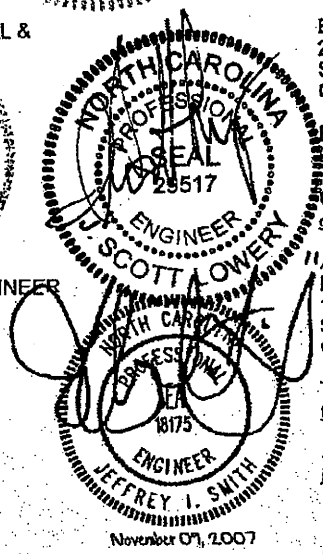

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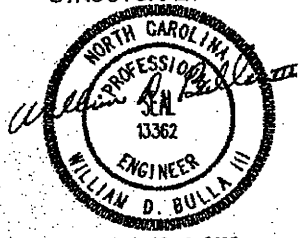

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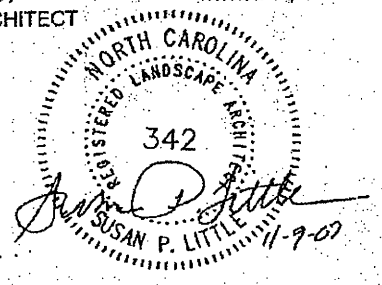

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PROJECT DIRECTORY

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SECTION 033000 - 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 01 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:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.

B. Related Sections include the following:

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

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.

1. 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. Samples: For waterstops and vapor retarder.

E. Qualification Data: For Installer manufacturer.

F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

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

1. Cementitious materials.
2. Admixtures.
3. Waterstops.
4. Curing compounds.
5. Floor and slab treatments.
6. Vapor retarders.
7. Joint-filler strips.
8. Repair materials.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

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.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. 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.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. 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:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. 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.

1. Plywood, metal, or other approved panel materials.

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, 3/4 by 3/4 inch, 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.

1. 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.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 82, as drawn.

C. 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, Grade 60, 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:

1. 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:

1. Portland Cement: ASTM C 150, Type I/II , gray. Supplement with the following:

   a. Fly Ash: ASTM C 618, Class F.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.

D. Water: ASTM C 94/C 94M.

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.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

2.7 WATERSTOPS

A. 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.

1. Available Products:

a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
b. Concrete Sealants Inc.; Conseal CS-231.
c. Greenstreak; Swellstop.
d. Henry Company, Sealants Division; Hydro-Flex.
e. JP Specialties, Inc.; Earthshield Type 20.
f. Progress Unlimited, Inc.; Superstop.
g. TCMiraDRI; Mirastop.

2.8 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Available Products:

a. Fortifiber Corporation; Moistop Ultra A.
b. Raven Industries Inc.; Vapor Block 15.
c. Reef Industries, Inc.; Griffolyn Type-65G.

2.9 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: For locations scheduled to receive a "sealed concrete" finish. Clear, chemically reactive, waterborne solution of inorganic silicate or

siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

1. Available Products:

   a. Burke by Edoco; Titan Hard.
   b. ChemMasters; Chemisil Plus.
   c. ChemTec International; ChemTec One.
   d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Intraseal.
   e. Curecrete Distribution Inc.; Ashford Formula.
   f. Dayton Superior Corporation; Day-Chem Sure Hard.
   g. Euclid Chemical Company (The); Euco Diamond Hard.
   h. Kaufman Products, Inc.; SureHard.
   i. L&M Construction Chemicals, Inc.; Seal Hard.
   j. Meadows, W. R., Inc.; Liqui-Hard.
   k. Metalcrete Industries; Floorsaver.
   l. Nox-Crete Products Group, Kinsman Corporation; Duranox.
   m. Symons Corporation, a Dayton Superior Company; Buff Hard.
   n. US Mix Products Company; US Spec Industraseal.
   o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS.

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Available Products:

   a. Axim Concrete Technologies; Cimfilm.
   b. Burke by Edoco; BurkeFilm.
   c. ChemMasters; Spray-Film.
   d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
   e. Dayton Superior Corporation; Sure Film.
   f. Euclid Chemical Company (The); Eucobar.
   g. Kaufman Products, Inc.; Vapor Aid.
   h. Lambert Corporation; Lambco Skin.
   i. L&M Construction Chemicals, Inc.; E-Con.
   j. MBT Protection and Repair, Div. of ChemRex; Confilm.
   k. Meadows, W. R., Inc.; Sealtight Evapre.
   l. Metalcrete Industries; Waterhold.
   m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
   n. Sika Corporation, Inc.; SikaFilm.
   o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
   p. Unitex; Pro-Film.
   q. US Mix Products Company; US Spec Monofilm ER.
   r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

B. Water: Potable.

C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Available Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoco; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
m. Tamms Industries, Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. US Mix Products Company; US Spec Maxcure Resin Clear.
p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

B. Reglets: Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

A. Repair Underlayment: Only for areas beneath floor coverings: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
5. Repair Overlayment: Not Applicable: Nonconforming areas of exposed slabs must be replaced at Architect's direction.

2.13 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.

1. 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 in concrete as follows:

1. Fly Ash: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a water-cementitious materials ratio below 0.50.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Slump Limit: 5 inches , plus or minus 1 inch.

B. Foundation Walls and Column Pedestals: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50 .
3. Slump Limit: 5 inches , plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

C. Slabs-on-Grade (Interior Locations): Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd..
3. Slump Limit: 5 inches, plus or minus 1 inch.
4.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

D. Slabs-on-Grade (Exterior Locations): Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd..
3. Slump Limit: 5 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

E. Suspended Slabs: Proportion structural lightweight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Calculated Equilibrium Unit Weight: 115 lb/cu. ft. , plus or minus 3 lb/cu. ft. as determined by ASTM C 567.
3. Slump Limit: 5 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size greater than 3/8 inch.

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, 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:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch 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.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. 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.

1. 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."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

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 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.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength.
2. 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 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.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT

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

1. 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.

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. 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.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

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:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- 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.
1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface and apply joint sealants, specified in Division 07 Section "Joint Sealants" .
2. 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. 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. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. 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.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. 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 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.

D. 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.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. 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.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. 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.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. 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.

1. 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 specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or 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 exposed to public view:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2.

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. 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.

1. Apply float finish to surfaces to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, or built-up or membrane roofing..

C. 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.

1. Apply a trowel finish to surfaces 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.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 3/16 inch

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces 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.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. 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.

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 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:

1. Moisture Curing <u>for all interior slabs on grade</u>: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.

2. Curing Compound: ONLY For exterior slabs NOT scheduled to receive concrete stain and elevated slab: 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.

3.14 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 28 days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. 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 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.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch 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 form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. 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.
3. 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.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. 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.
4. 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.

5. Repair defective areas, except random cracks and single holes 1 inch 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 3/4-inch 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.
6. Repair random cracks and single holes 1 inch 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 Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

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

B. Inspections:

1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.
6. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

   a. 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.

2. 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.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

7. 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.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. 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.

8. 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.
9. Test results shall be reported in writing to Architect, 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.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. 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.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

END OF SECTION 033000

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SECTION 035216 - LIGHTWEIGHT INSULATING CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes cast-in-place vermiculite aggregate insulating concrete for roof decks.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include mixing and application instructions for each type of lightweight insulating concrete.

B. Shop Drawings: Include plans, sections, and details showing roof slopes, lightweight insulating concrete thicknesses, embedded insulation board, roof penetrations, roof perimeter terminations and curbs, control and expansion joints, and roof drains.

C. Design mixtures.

D. Qualification data.

E. Material Test Reports: For lightweight aggregates.

F. Research/evaluation reports.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved by lightweight insulating concrete manufacturer.

1.4 PROJECT CONDITIONS

A. Do not place lightweight insulating concrete unless ambient temperature is 32 deg F (0 deg C) and rising.

B. Do not place lightweight insulating concrete during rain or snow or on surfaces covered with standing water, snow, or ice.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cementitious Material: Portland cement, ASTM C 150, Type I. Supplement with fly ash, ASTM C 618, Class C or F.

B. Mineral Aggregate: ASTM C 332, Group I, vermiculite.

C. Foaming Agent: ASTM C 869.

D. Water: Clean, potable.

E. Joint Filler: ASTM C 612, Class 2, glass-fiber type; compressing to one-half thickness under a load of 25 psi (172 kPa).

F. Steel Wire Mesh: Cold-drawn steel wire, galvanized, 0.041-inch (1.04-mm) diameter, woven into 2-inch (50-mm) hexagonal mesh, and reinforced with a longitudinal 0.062-inch- (1.57-mm-) diameter wire spaced 3 inches (75 mm) apart.

G. Galvanized Plain-Steel Welded Wire Reinforcement: ASTM A 185, 2 by 2 inches (50 by 50 mm), W0.5 by W0.5, fabricated from galvanized steel wire into flat sheets.

H. Molded-Polystyrene Insulation Board: ASTM C 578, Type I, 0.90-lb/cu. ft. (14.4-kg/cu. m) minimum density.

1. Provide units with keying slots of approximately 3 percent of board's gross surface area.

2.2 AGGREGATE LIGHTWEIGHT INSULATING CONCRETE

A. Produce lightweight insulating concrete using the minimum amount of water necessary to produce a workable mix.

B. Vermiculite Aggregate Mix: Lightweight insulating concrete produced from cementitious materials, water, air-entraining admixture, and vermiculite mineral aggregates with the following physical properties:

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

    a. Mandoval Vermiculite Products Inc.
    b. Palmetto Vermiculite Company.
    c. Siplast.
    d. Sun Gro Horticulture.

3. As-Cast Unit Weight: 45 to 49 lb/cu. ft. (720 to 785 kg/cu. m) at point of placement, when tested according to ASTM C 138/C 138M.
4. Oven-Dry Unit Weight: 23 to 26 lb/cu. ft. (370 to 416 kg/cu. m), when tested according to ASTM C 495.
5. Compressive Strength: Minimum 140 psi (965 kPa), when tested according to ASTM C 495.
6. Cement-to-Aggregate Ratio, by Volume: 1:6.

PART 3 - EXECUTION

3.1 PREPARATION

A. Control Joints: Install control joints at perimeter of roof deck and at junctures with vertical surfaces, including curbs, walls, and vents, for full depth of lightweight insulating concrete. Fill control joints with joint filler.

1. Provide 1-inch- (25-mm-) wide control joints for roof dimensions up to 100 feet (30 m) in length; 1-1/2-inch- (38-mm-) wide control joints for roof dimensions exceeding 100 feet (30 m).

B. Wire Mesh: Place steel wire mesh with longest dimension perpendicular to steel deck ribs. Cut mesh to fit around roof openings and projections. Terminate mesh at control joints. Lap sides and ends of mesh at least 6 inches (150 mm).

C. Welded Wire Reinforcement: Place steel welded wire reinforcement with longest dimension perpendicular to steel deck ribs. Cut reinforcement to fit around roof openings and projections. Terminate reinforcement at control joints. Lap sides and ends of reinforcement at least 6 inches (150 mm).

3.2 MIXING AND PLACING

A. Mix and place lightweight insulating concrete according to manufacturer's written instructions, using equipment and procedures to avoid segregation of mixture and loss of air content.

B. Install insulation board according to lightweight insulating concrete manufacturer's written instructions. Place insulation board in wet, lightweight insulating concrete slurry poured a minimum of 1/8 inch (3 mm) over the structural substrate. Ensure full contact of insulation board with slurry. Stagger joints and tightly butt insulation boards.

1. Install insulation board in a stair-step configuration with a maximum step-down of 1 inch (25 mm).

C. Deposit and screed lightweight insulating concrete in a continuous operation until an entire panel or section of roof area is completed. Do not vibrate or work mix except for screeding or floating. Place to depths and slopes indicated.

D. Finish top surface smooth, free of ridges and depressions, and maintain surface in condition to receive subsequent roofing system.

E. Begin curing operations immediately after placement, and air cure for not less than three days according to manufacturer's written instructions.

F. If ambient temperature falls below 32 deg F (0 deg C), protect lightweight insulating concrete from freezing and maintain temperature recommended by manufacturer for 72 hours after placement.

END OF SECTION 035216

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SECTION 03 53 00 - CONCRETE TOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Emery-aggregate concrete floor topping.
2. Iron-aggregate concrete floor topping.

1.2 SUBMITTALS

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

B. Product test reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Emery-Aggregate Concrete Floor Topping:

a. Anti-Hydro International, Inc.; A-H Emery A-1 Premix.
b. Dayton Superior Corporation; Emery Tuff Top.
c. Emeri-Crete, Inc.; Emeri-Crete.
d. L&M Construction Chemicals, Inc.; Emerytop 400.
e. Metalcrete Industries; Met-Top E.
f. Vexcon Chemicals, Inc.; Emeri-Crete SH.

2. Iron-Aggregate Concrete Floor Topping:

a. Anti-Hydro International, Inc.; A-H Irontop.
b. Burke by Edeco; Iron Topping.
c. Conspec Marketing & Manufacturing Co., Inc.; Conplate Floor Topping.
d. Euclid Chemical Company (The); Super Euco-Top.
e. MBT Protection and Repair, Div. of ChemRex; Mastertop Anvil-Top 300.
f. Metalcrete Industries; Metalcrete.

2.2 CONCRETE FLOOR TOPPINGS

A. Emery-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded, crushed emery aggregate containing not less than 50 percent aluminum oxide, not less than 24 percent ferric oxide, and not more than 8 percent silica; portland cement or blended

hydraulic cement; plasticizers; and other admixtures to which only water needs to be added at Project site.

1. Compressive Strength (28 Days): **7000 psi (48 MPa)**; ASTM C 109/C 109M.

B. Iron-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded iron aggregate, portland cement, plasticizers, and other admixtures to which only water needs to be added at Project site.

1. Compressive Strength (28 Days): **10,000 psi (69 MPa)**; ASTM C 109/C 109M.

2.3 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.

C. Moisture-Retaining Cover: ASTM C 171.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 25 percent solids content, minimum.

2.4 RELATED MATERIALS

A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of 80 per ASTM D 2240.

B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

C. Portland Cement: ASTM C 150, Type I or II.

D. Sand: ASTM C 404, fine aggregate passing No. 16 (1.18-mm) sieve.

E. Water: Potable.

F. Acrylic-Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

G. Epoxy Adhesive: ASTM C 881, Type V, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

2.5 MIXING

A. Bonding Slurry: Mix portland cement with water to a thick paint consistency.

B. Floor Topping: Mix concrete floor topping materials and water in appropriate drum-type batch machine mixer or truck mixer according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch (6 mm.)

1. Prepare and clean existing base slabs according to concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
2. Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch (13 mm) and fill with semirigid joint filler.

B. Install joint-filler strips where topping abuts vertical surfaces.

3.2 FLOOR TOPPING APPLICATION

A. Monolithic Floor Topping: After textured-float finish is applied to fresh concrete of base slabs specified in Division 03 Section "Cast-in-Place Concrete," place concrete floor topping while concrete is still plastic.

B. Deferred Floor Topping: Within 72 hours of placing base slabs, mix and scrub bonding slurry into dampened concrete to a thickness of 1/16 to 1/8 inch (1.6 to 3 mm), without puddling. Place floor topping while slurry is still tacky.

C. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch (1.6 to 3 mm), without puddling. Place floor topping while adhesive is still tacky.

D. Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.

1. Screed surface with a straightedge and strike off to correct elevations.
2. Slope surfaces uniformly where indicated.
3. Begin initial floating using bull floats to form a uniform and open-textured surface plane free of humps or hollows.

E. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.

1. Hard Trowel Finish: After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel without allowing blisters to develop. Continue troweling passes and restraighten until surface is smooth and uniform in texture.
2. Finish and measure surface so gap at any point between surface and an unleveled freestanding 10-foot- (3-m-) long straightedge, resting on 2 high spots and placed anywhere on the surface, does not exceed 1/4 inch (6 mm).

F. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Architect.

G. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.

1. Form joints in concrete floor topping over contraction joints in base slabs, unless otherwise indicated.
2. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.
3. Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch (13 mm) deep.
4. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.

3.3 PROTECTING AND CURING

A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.

B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.

C. Begin curing immediately after finishing concrete floor topping. Cure by the following method, according to concrete floor topping manufacturer's written instructions:
1. Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller according to manufacturer's written instructions. Maintain continuity of coating and repair damage during curing period.

3.4 REPAIRS

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

END OF SECTION 035300

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).

B. See Division 05 Section "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.

C. See Division 07 Section "Sheet Metal Flashing and Trim" for furnishing manufactured reglets installed in masonry joints for metal flashing.

1.2 SUBMITTALS

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

B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement.

C. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

1. For masonry units include material test reports substantiating compliance with requirements.

D. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

1.3 QUALITY ASSURANCE

A. Pre-construction Testing Service: Owner will engage a qualified independent testing agency to perform pre-construction testing indicated below. Payment for these services will be made by the Owner.

1. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
2. Mortar Test (Property Specification): For each mix required, per ASTM C 780.

1.4 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by

frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

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 Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. 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.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13.1 MPa).
2. Weight Classification: **Lightweight**.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91

D. Aggregate for Mortar: ASTM C 144.

1. For joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Aggregate for Grout: ASTM C 404.

F. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

I. Water: Potable.

2.4 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement: ASTM A 951; mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls.

1. Wire Size for Side Rods: W1.7 or 0.148-inch (3.8-mm) diameter.
2. Wire Size for Cross Rods: W1.7 or 0.148-inch (3.8-mm) diameter.
3. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
4. Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.5 TIES AND ANCHORS

A. Materials:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.

1. Wire: Fabricate from **[3/16-inch- (4.8-mm-)]** **[1/4-inch- (6.4-mm-)]** diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from **[0.188-inch- (4.8-mm-)] [0.25-inch- (6.4-mm-)]** diameter, hot-dip galvanized steel wire.
3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from **[0.053-inch- (1.3-mm-)] [0.097-inch- (2.5-mm-)]** thick, steel sheet, galvanized after fabrication.

E. Partition Top anchors: 0.097-inch- (2.5-mm-) thick metal plate with 3/8-inch- (10-mm-) diameter metal rod 6 inches (150 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.4 mm) thick by 24 inches (600 mm) long, with ends turned up 2 inches (50 mm) or with cross pins.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.6 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 07 Section "Sheet Metal Flashing and Trim."

1. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
2. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 3/8 inch (10 mm) to form a stop for retaining sealant backer rod.
3. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

B. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy 0.025 inch (0.6 mm) thick, with a 0.015-inch- (0.4-mm-) thick coating of rubberized-asphalt adhesive.

a. Products:

1) Hyload, Inc.; Hyload Cloaked Flashing System.

2. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch (1.0 mm) thick.

a. Products:

1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
2) Firestone Building Products; FlashGuard.
3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from **[neoprene] [urethane] [or] [PVC]**.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following, unless otherwise indicated:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

a. Products:

1) Advanced Building Products Inc.; Mortar Maze weep vent.
2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
3) Heckmann Building Products Inc.; No. 85 Cell Vent.
4) Hohmann & Barnard, Inc.; Quadro-Vent.
5) Wire-Bond; Cell Vent.

2.8 INSULATION

A. Loose-Granular Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

B. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide specially shaped units designed for installing in cores of masonry units.

1. Products:

a. Concrete Block Insulating Systems; Korfil.
b. Shelter Enterprises Inc.; Omni Core.
c. <

C. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, closed-cell product extruded with an integral skin.

D. Polyisocyanurate Board Insulation: ASTM C 1289, Type I (aluminum-foil-faced), Class 2 (glass-fiber-reinforced).

2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior non-load-bearing partitions, Type O may be used instead of Type N.

C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

D. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

3.2 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

E. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.4 MASONRY-CELL INSULATION

A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to 1 story in height, but not more than 20 feet (6 m).

B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.5 MASONRY JOINT REINFORCEMENT

A. General: Install in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than **[1/2 inch (13 mm)] [1 inch (25 mm)]** in width between masonry and structural member, unless otherwise indicated.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.7 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing as recommended by flashing manufacturer.
2. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.

4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches (600 mm) o.c., unless otherwise indicated.
3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.8 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.9 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

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

1. Payment for these services will be made by Owner.

C. Testing Frequency: One set of tests for each 5000 sq. ft. (465 sq. m) of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.10 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch (19 mm) with a steel-trowel finish. Form a wash at top of parging and a cove at bottom. Damp-cure parging for at least 24 hours and protect parging until cured.

3.11 CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect adjacent surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.12 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
2. Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 047300 – MANUFACTURED STONE VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Portland cement based manufactured stone veneer and trim.

1.2 REFERENCES

A. Building code applicable to project site.

B. American National Standards Institute (ANSI)
   1. ANSI A118.4 Specifications for Latex-Portland Cement Mortar

C. American Society for Testing and Materials (ASTM):
   1. ASTM C 39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
   2. ASTM C 67–Test Methods for Sampling and Testing Brick and Structural Clay Tile
   3. ASTM C 144–Specification for Aggregate for Masonry Mortar
   4. ASTM C 177–Test Method for Steady-State Head Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
   5. ASTM C 190 – Method of Test for Tensile Strength of Hydraulic Cement Mortars
   6. ASTM C 207–Specification for Hydrated Lime for Masonry Purposes
   7. ASTM C 270–Specification for Mortar for Unit Masonry
   8. ASTM C 348 – Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
   9. ASTM C 482– Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement
   10. ASTM C 567–Test Method for Unit Weight of Structural Lightweight Concrete
   11. ASTM C 847–Specification for Metal Lath
   12. ASTM C 979–Specification for Pigments for Integrally Colored Concrete
   13. ASTM D 226–Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

1.3 SUBMITTALS

A. Product Data: Submit product data for each different veneer, accessory, and other manufactured product specified.

B. Material Certificates: Submit material certificates for the following, signed by manufacturer and Contractor. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

   1. Each type of concrete masonry unit.
   2. Cementitious materials. Include brand, type, and name of manufacturer.
   3. Each type and size of anchors, ties, and metal accessory.

C. Samples:
   1. Standard sample board consisting of small-scale pieces of veneer units showing full range of textures and colors.
   2. Full range of mortar colors.
   3. Verification Samples: Following initial sample selection submit "laid-up" sample board using the selected stone and mortar materials and showing the full range of colors expected in the finished Work; minimum sample size: 3 by 3 feet (1 by 1 m).
   4. Quality Assurance/Control Submittals
      a. Qualifications:
         1) Proof of manufacturer qualifications.
         2) Proof of installer qualifications.
      b. Regulatory Requirements: Evaluation reports
      c. Veneer manufacturer's installation instructions.
      d. Installation instructions for other materials

D. Closeout Submittals: Reference Section 01780–Closeout Submittals; submit following items:
   1. Maintenance Instructions.
   2. Special Warranties.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: Licensee of Eldorado Stone Corporation
   2. Installer Qualifications: Experienced mason with a minimum of five years of experience installing manufactured veneer.

B. Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

   1. National Concrete Masonry Association (NCMA) "TEK" Information Series.

   2. American Concrete Institute (ACI):

      a. ACI 530.1/ASCE 6 "Specifications for Masonry Structures."

      b. ACI 530/ASCE 5 "Building Code Requirements for Masonry Structures."

   3. Brick Industries of America (BIA) "Technical Notes on Brick Construction".

   4. ASTM C 926 "Application of Portland Cement Based Plaster."

C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, through one source from a single manufacturer for each product required.

D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

E. Mock-up: Prepare mock-up to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Construct a 6'-0"' high x 4'-0" wide mock-up using approved material selections on the site at a location approved by the Owner. Mock-up shall include scheduled stud wall framing, sheething, plaster coat, manufactured stone veneer and any other materials that will be used on the final installation.
2. Approval of the mock-up is for color, texture, pattern, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

    a. Approval of mock-up does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

F. Pre-installation Conference: Conduct conference at Project site to comply with project requirements. Prior to the start of masonry work, and at the Contractor's direction, meet at the site and review the installation procedures and coordination with other work. Meeting shall include Contractor, Owner, Architect, concrete installer, window wall installer, mason, as well as any other subcontractors or material technical service representatives whose work, or products, must be coordinated with the masonry work.

G. Manufacturer's Field Services: Manufacturer's Field Service Representative shall make periodic site visits for installation consultation and inspection as requested by Owner

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided. During cold weather stockpile aggregates so that it may be possible to heat them for use in mixing mortar in compliance with ACI recommendations for cold weather masonry practices.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Stain Prevention: Prevent mortar, and soil from staining the face of masonry to be left exposed. Immediately remove mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Eldorado Stone, LLC

1370 Grand Avenue, Building B

San Marcos, CA 92069

800.925.1491

B. Product: "Nantucket" Stacked Stone

2.2 MATERIALS

A. Veneer Units: Precast veneer units consisting of Portland cement, sand, lightweight aggregates, and mineral oxide pigments.

1. Physical Properties

a.	Compressive Strength: ASTM C 39, 5 sample ave	1,800psi (12.4 Mpa)
b.	Shear Test: ASTM C 482	50psi 345 kPa)
c.	Water Absorption: UBC Standard 15-5	22 percent
d.	Freeze-Thaw Test: ASTM C 67	Less than 3%
e.	Thermal Resistance: ASTM C 177	R0.60 (0.11)
f.	Density: ASTM C 567 (Dry Density)	75 pcf (1200 kg per m^3)

2.3 MORTAR MATERIALS

A. Pigmented Mortar: Colored Portland cement-lime formulation as required to match the color of each face brick and each decorative concrete masonry unit indicated. Mortar pigments shall be manufactured from mineral and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

B. Aggregate for Mortar: ASTM C 144.

C. Cold-Weather Admixture: Not allowed.

D. Water: Potable.

E. Scratch Coat Materials for Portland Cement Plaster Scratch Coat:

1. Portland cement, ASTM C 150, Type I or Type II, grey.

2. Lime: Special hydrated lime for finishing purposes, ASTM C 206, Type S; or special hydrated lime for masonry purposes, ASTM C 207, Type S.

3. Sand Aggregate for Base Coats: ASTM C 897, Article 'Sand Aggregate for Base Coat'.

4. Scratch Coat Fiber: Alkaline-resistant (AR) glass or polypropylene fibers, complying with ASTM C 1116, 1/2" to 2" long, free of contaminates, manufactured for use in portland cement plaster. Provide the quantity per batch in strict accordance with the published directions of the fiber manufacturer; in no case shall more than 2 lb. of fiber per cubic foot of cementitious material be permitted.

5. Water: Potable.

2.4 EMBEDDED FLASHING MATERIALS

A. Stainless Steel Flashing: Refer to Section 07620.

B. Metal Drip Edges: Extending at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and then down into joint 3/8 inch to form a stop for retaining sealant backer rod.

1. Material: Stainless steel, 0.0156 inch thick.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Steel Shelf Angles and Lintels: Refer to Structural Drawings.

B. Metal Lathing: Refer to Section 09220, PORTLAND CEMENT PLASTER, for lathing requirements to receive the installation of the decorative concrete masonry units indicated as ST-1.

C. Compressible Filler: Pre-molded closed cell neoprene filler strips with peel off pressure sensitive adhesive one side, complying with ASTM D 1056, Type 2, Class A, Grade 1; minimum 2-3/4" wide, and having a minimum 50% compressibility.

D. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

E. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

F. Wood Nailers: Refer to Section 06105 "Miscellaneous Carpentry."

G. Sealants and Joint Fillers: Refer to Section 07920 "Joint Sealants."

2.6 MORTAR MIXES

A. Jointless / Dry Stacked Installation.
1. Mix mortar in accordance with Eldorado Stone Corporation mortar preparation instructions.
2. Add color pigment in accordance with pigment manufacturer's instructions.

B. General: Do not use admixtures, including air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar.
2. Limit cementitious materials in mortar to Portland cement and lime.

C. Portland Cement Plaster for Scratch Coat over Metal Lath: Comply with ASTM C 926 for Portland cement plaster base coat mixes as applicable to plaster bases, materials, and other requirements indicated. Adjust mix proportions below within limits specified to attain workability. Add fiber to following scratch coat mix after ingredients have mixed at least 2 minutes. Reduce aggregate quantities accordingly to maintain workability.

1. 1 part Portland cement, 1 part lime, to 4 parts base coat aggregate, fibered.

D. Cement-Paste Bond Coat For Adhered Veneer Units (ST-1): Mix of cement and water and water to a consistency similar to that of thick cream.

E. Mortar for Adhered Veneer Units : Comply with ASTM C 270, Proportion Specification. Provide Type S mortar.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION, GENERAL

A. Comply with ACI 530.1/ASCE 6, ACI 530/ASCE 5 and other requirements indicated applicable to each type of installation included in Project.

B. Thickness: Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

C. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications.

D. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

E. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Install cut units with cut surfaces and, where possible, cut edges concealed.

F. Select and arrange units for exposed decorative masonry units to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

G. No open celled units will be permitted on exposed masonry.

H. Do not use chipped, cracked, broken, stained, or otherwise damaged units. Do not use units with voids.

3.3 ERECTION TOLERANCES

A. Comply with the erection tolerances as accepted on the mockup panels and the sample installation(s).

3.4 ADHERING MASONRY VENEER

A. Portland Cement Plaster Scratch Coat Application:

1. Do not use materials that are frozen, caked, lumpy, dirty, or contaminated by foreign materials. Clean mechanical mixers, mixing boxes and tools after mixing each batch; keep free of plaster from previous mixes. Thoroughly mix plaster with proper amount of water until uniform in color and consistency.

2. Do not use excessive water in mixing and applying plaster materials.

3. Sequencing:

a. Sequence plaster application with installation and protection of other work, including aluminum windows and curtain walls, steel door frames and hardware, coping placement, and roofing, so that neither will be damaged by installation of other.

b. Apply each plaster coat to an entire wall panel without interruption to avoid cold joints.

c. Wet plaster shall abut set plaster at naturally occurring interruptions in the plane of the plaster, such as corners, rustications, openings control joints.

4. Apply Portland plaster scratch coat over metal lath plaster base, as follows to result in a nominal thickness of 3/8" for vertical (wall) planes when measured from the back plane of the self furring metal lath exclusive of lath dimples. Apply Portland cement plaster by hand or machine application.

a. Apply scratch coat with sufficient material and pressure to form full keys through and to embed the metal lath, and with sufficient thickness of material over the metal to allow for scoring the surface. As soon as the scratch coat becomes firm, the entire surface shall be cross raked (scored). Vertical surfaces shall be scored horizontally. Nominal thickness of scratch coat shall be 3/8" for vertical (wall) planes.

B. Coat backs of masonry veneer units and face of scratch coat with neat Portland cement-paste bond coat, then butter both surfaces with mortar. Use sufficient mortar so a slight excess will be forced out the edges of masonry veneer units as they are set. Tap units into place, completely filling space between units and scratch coat.

1. The resulting thickness of the mortar in back of the veneer units shall not be less than 3/8" nor more than 1-1/4" in compliance with the IBC 2000 Code and ACI 530.1.

C. Tool mortar joints to match the sample installation.

3.5 FLASHING AND WEEP HOLES

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

1. Extend flashing 4 inches (100 mm) at ends and turn flashing up not less than 2 inches (50 mm) to form an end dam.

B. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing.

1. Use plastic tubing or open head joints to form weep holes.
2. Space weep holes nominally 32 inches o.c. In cavities, place pea gravel to a height equal to height of first course, but not less than 2", immediately above top of flashing embedded in the wall, as masonry construction progresses, to splatter mortar droppings and to maintain drainage.

3.6 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry to provide an unbroken vertical separation through all single wythe masonry walls, at locations indicated. Where locations are not shown, construct control joints throughout the unbroken length of exposed masonry walls at approximately 30' 0" centers. Also, place control joints at points of natural weakness in the masonry work, including the following locations:

1. Above and below major openings, at one jamb if opening is less than 6'-0" wide and at both jambs if opening is over 6'-0" wide.
2. At locations where masonry wall height changes by more than 20 percent.
3. Above expansion, construction or control joints in the supporting structure.
4. Where end of masonry wall butts against supporting structure.
5. At return angles in "L", "T", and "U" shaped intersections.

B. Build in horizontal pressure relieving joints where indicated; construct joints by inserting nonmetallic 50 percent compressible joint filler of width required to permit installation of sealant and backer rod specified in Section 07920 'Joint Sealants'.

1. Locate horizontal pressure relieving joints beneath shelf angles supporting masonry veneer.

3.7 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged. Install new units in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

END OF SECTION 0473000

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SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Structural steel.
2. Grout.

B. Related Sections include the following:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Metal Fabrications" for steel lintels or 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's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand LRFD loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Load and Resistance Factor Design," Volume 2, Part 9 .

B. Construction: Type FR, fully restrained.

1.5 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.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

C. Welding certificates.

D. Qualification Data: For Installer and fabricator .

E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.

F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. Erector Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE at time of bid.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Certification Program and is designated an AISC Certified Plant, Category **STD** at time of bid.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD at time of bid.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
3. AISC's " Load and Resistance Factor Design Specification for Structural Steel Buildings."
4. AISC's "Specification for the Design of Steel Hollow Structural Sections."

5. AISC's " Specification for Load and Resistance Factor Design of Single-Angle Members."
6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 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 erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. 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.

1.8 COORDINATION

A. Furnish 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 .

B. Channels, Angles : 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. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain .

B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

C. Unheaded Anchor Rods: ASTM F 1554, Grade 36 .

1. Configuration: Straight.
2. Nuts: ASTM A 563 heavy hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436 hardened carbon steel.
5. Finish: Plain .

D. Headed Anchor Rods: ASTM F 1554, Grade 36 , straight.

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436 hardened carbon steel.
4. Finish: Plain .

2.3 PRIMER

A. Primer: SSPC-Paint 25 BCS, Type II, iron oxide, zinc oxide, raw linseed oil, and alkyd.

B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, 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's " Load and Resistance Factor Design Specification for Structural Steel Buildings."

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. 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.

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. Holes: Provide holes required for securing other work to structural steel and for passage of other work 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. Base-Plate 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.

1. Joint Type: Snug tightened .

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

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.
2. Surfaces to be field welded.
3. 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 6/NACE No. 3, "Commercial Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. 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 inaccessible surfaces 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 holes and grind smooth after galvanizing.
2. Galvanize lintels, shelf angles attached to structural-steel frame and located in exterior walls and all steel exposed to weather.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, 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.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and " Load and Resistance Factor Design Specification for Structural Steel Buildings."

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.

3. 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 base or bearing plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base or bearing 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 forming 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.

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 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 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and " Load and Resistance Factor Design Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

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: Field-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.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.
2. Composite floor deck.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for concrete fill.
2. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Division 05 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. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

B. 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 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. Steel Deck:

a. ASC Profiles, Inc.
b. Canam Steel Corp.;The Canam Manac Group.
c. Consolidated Systems, Inc.
d. DACS, Inc.
e. D-Mac Industries Inc.
f. Epic Metals Corporation.
g. Marlyn Steel Decks, Inc.
h. New Millennium Building Systems, LLC.
i. Nucor Corp.; Vulcraft Division.
j. Roof Deck, Inc.
k. United Steel Deck, Inc.
l. Valley Joist; Division of EBSCO Industries, Inc.
m. Verco Manufacturing Co.
n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 , G90 zinc coating.
2. Deck Profile: Type WR, wide rib .
3. Profile Depth: 1-1/2 inches .
4. Design Uncoated-Steel Thickness: 0.0295 inch .
5. Span Condition: Double span.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating.
   2. Profile Depth: 3 inches.
   3. Design Uncoated-Steel Thickness: 0.0358 inch .
   4. Span Condition: Triple span or more.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

C. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

D. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.

E. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

F. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

G. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

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. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. 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.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. 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 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:

1. Weld Diameter: 3/4 inch], nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supportsat spacings indicated, and as follows:

1. Mechanically fasten with self-drilling, No. 10 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, with end joints as follows:

1. End Joints: Lapped 2 inches minimum .

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

E. 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.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 3/4 inch, nominal.
2. Weld Spacing: Space and locate welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 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, with end joints as follows:

1. End Joints: Butted.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 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.

3.6 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. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior non-load-bearing wall framing.

B. Related Sections include the following:

   1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

   1. Design Loads: As indicated.

   2. Deflection Limits: Design framing systems to withstand full, unreduced, component and cladding design wind loads without deflections greater than the following:
      a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.

   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

      a. Upward and downward movement of 1/2 inch 3/4 inch 1-1/2 inches.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
   1. Expansion anchors.
   2. Power-actuated anchors.
   3. Mechanical fasteners.
   4. Vertical deflection clips.
   5. Miscellaneous structural clips and accessories.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in North Carolina and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.
8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST33H .
2. Coating: G60, A60, AZ50, or GF30 .

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1 or 2.
2. Coating: G90.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch .
2. Flange Width: 1-5/8 inches .

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

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. Dietrich Metal Framing; a Worthington Industries Company.
b. MarinoWare, a division of Ware Industries.
c. SCAFCO Corporation
d. The Steel Network, Inc.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Anchor clips.
4. End clips.
5. Foundation clips.
6. Stud kickers, knee braces, and girts.
7. Hole reinforcing plates.
8. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

B. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by screw fastening. Wire tying of framing members is not permitted.
   a. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 PREPARATION

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by screw fastening. Wire tying of framing members is not permitted.
   a. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

G. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
1. Connect vertical deflection clips to bypassing studs and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 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.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Miscellaneous steel framing and supports.
2. Shelf angles.
3. Loose bearing and leveling plates.
4. Steel weld plates and angles.
5. Pipe guards.
6. Loose steel lintels.

B. See Division 05 Section "Pipe and Tube Railings" for metal pipe and tube railings.

1.2 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

B. Templates: For anchors and bolts.

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 Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. 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.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

B. Ferrous Metals:
1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
3. Steel Tubing: ASTM A 500, cold-formed steel tubing.
4. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
5. Slotted Channel Framing: Cold-formed metal channels complying with MFMA-3, 1-5/8 by 1-5/8 inches (41 by 41 mm). Channels made from galvanized steel complying with ASTM A 653/A 653M, structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.079-inch (2-mm) nominal thickness.

C. Nonferrous Metals:

1. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T6.
2. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.
3. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

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

B. Cast-in-Place Anchors in Concrete: Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/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.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79.

B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Products:

a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
b. Carboline Company; Carbozinc 621.
c. ICI Devoe Coatings; Catha-Coat 313.
d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
g. Tnemec Company, Inc.; Tneme-Zinc 90-97.

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

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

E. Concrete Materials and Properties: Comply with requirements in Division 03 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.

2.5 FABRICATION

A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
5. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 24 inches (600 mm) o.c.

B. Miscellaneous Framing and Supports: Provide steel framing and supports not specified in other Sections as needed to complete the Work. Fabricate units from steel shapes, plates, and bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate steel girders for wood frame construction from continuous steel shapes. Where wood nailers are attached to girders with bolts or lag screws, drill holes at 24 inches (600 mm) o.c.
2. Fabricate steel pipe columns for supporting wood frame construction with steel baseplates and top plates welded to pipe with fillet welds the same size as pipe wall thickness.

C. Loose Steel Lintels: Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

1. Lintels in Exterior Walls: Galvanize.

D. Shelf Angles: Fabricate shelf angles of sizes indicated and for attachment to framing. Fabricate with 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.

1. Shelf Angles in Exterior Walls: Galvanize.
2. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

E. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts.

F. Miscellaneous Steel Trim: Fabricate units from 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. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Exterior Miscellaneous Steel Trim: Galvanize].

G. Pipe Guards: Fabricate from 3/8-inch- (9.5-mm-) thick by 12-inch- (300-mm-) wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch (50-mm) clearance between pipe and pipe guard. Drill each end for two 3/4-inch (19-mm) anchor bolts.

2.6 FINISHES

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

B. Steel and Iron Finishes:

1. Hot-dip galvanize items as indicated to comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.
2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed metal fabrications:

   a. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   b. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

3. Shop Priming: 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, to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.

1. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
2. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
3. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

B. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack solidly with nonshrink, nonmetallic grout.

C. Touch up surfaces and finishes after erection.

1. Painted Surfaces: Clean field welds, bolted connections, and abraded areas and touch up paint with the same material as used for shop painting.

2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

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SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Aluminum pipe and tube railings.
2. Steel pipe and tube railings.

1.2 PERFORMANCE REQUIREMENTS

A. 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. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) 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. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) 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 (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
c. Infill load and other loads need not be assumed to act concurrently.

B. 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 mechanically connected railings, 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 each exposed finish required.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

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. 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. Steel Pipe and Tube Railings:

   a. Pisor Industries, Inc.
   b. Sharpe Products.
   c. Wagner, R & B, Inc.; a division of the Wagner Companies.

2.2 METALS

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

B. Aluminum: 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.

1. Extruded Bars and Tubing: ASTM B 221 (ASTM B 221M), Alloy 6063-T5/T52.
2. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6063-T6.
3. Drawn Seamless Tubing: ASTM B 210 (ASTM B 210M), Alloy 6063-T832.

4. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
5. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), Alloy 6061-T6.
6. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.
7. Woven-Wire Mesh: Intermediate-crimp, 2-inch (50-mm) woven-wire mesh, made from 0.162-inch (4.1-mm) nominal diameter wire complying with ASTM B 211 (ASTM B 211M), Alloy 6061-T94.

C. Steel and Iron:

1. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.
2. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
3. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
4. Plates, Shapes, and Bars: ASTM A 36/A 36M.
5. Castings: Either gray or malleable iron, unless otherwise indicated.

    a. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
    b. Malleable Iron: ASTM A 47/A 47M.

6. Expanded Metal: ASTM F 1267, Type I (expanded), Class 1 (uncoated).
7. Woven-Wire Mesh: Intermediate-crimp, 2-inch (50-mm) woven-wire mesh, made from 0.135-inch (3.5-mm) nominal diameter wire complying with ASTM A 510 (ASTM A 510M).

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Provide concealed fasteners, unless unavoidable or standard for railings indicated.

1. Aluminum Railings: Type 304 stainless-steel fasteners.
2. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Anchors: Provide cast-in-place, chemical 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.

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

D. Shop Primers: Provide primers that comply with Division 09.

E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

F. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

G. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer compatible with finish paint systems indicated, and complying with SSPC-Paint 5.

H. Grout and Anchoring Cement: Factory-packaged, nonshrink, nonmetallic grout complying with ASTM C 1107; or water-resistant, nonshrink anchoring cement; recommended by manufacturer for exterior use.

2.4 FABRICATION

A. General: Fabricate railings to comply with design, dimensions, and details indicated, but not less than that required to support structural loads.

B. 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.

C. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds, using manufacturer's standard system of sleeve and socket fittings.

D. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings.

E. Form changes in direction by bending or by inserting prefabricated elbow fittings.

F. Form curves by bending in jigs to produce uniform curvature; maintain cross section of member throughout bend without cracking or otherwise deforming exposed surfaces.

G. Close exposed ends of railing members with prefabricated end fittings.

H. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

J. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch (25-by-13-by-3-mm) metal channel frames.

2.5 FINISHES

A. Aluminum:

1. Mechanical Finish: AA-M12 (Mechanical Finish: nonspecular as fabricated).
2. Class I, Clear Anodic Finish: AA-M12C22A41 complying with AAMA 611.
3. Class I, Color Anodic Finish: AA-M12C22A42/A44 complying with AAMA 611.

    a. Color: As selected by Architect from full range of industry colors and color densities.

B. Steel and Iron:

1. Galvanized Railings: Hot-dip galvanize railings, after fabrication, to comply with ASTM A 123/A 123M. Provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
2. Shop-Primed Galvanized Railings: After galvanizing, clean railings, treat with metallic-phosphate process, and apply primer to comply with SSPC-PA 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation.

1. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
2. 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 (5 mm in 3 m).

B. 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.

C. Anchor posts in concrete by inserting into preset steel pipe sleeves, formed or core-drilled holes and grouting annular space.

D. Anchor posts to metal surfaces with oval flanges.

E. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

F. Attach handrails to wall with wall brackets.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. For wood stud partitions, use hanger or lag bolts set into wood backing between studs.

G. Adjusting and Cleaning:

1. 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.
2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055213

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SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Framing with engineered wood products..
3. Wood blocking, cants, and nailers.
4. Wood furring and grounds.
5. Plywood backing panels.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.

1.3 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Dimension lumber framing.
2. Laminated-veneer lumber.
3. Prefabricated wood I-joists.
4. Rim boards.
5. Miscellaneous lumber.

PART 2 - PRODUCTS

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2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat **all rough carpentry, unless otherwise indicated.**

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat all rough carpentry, unless otherwise indicated.

2.4 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent for 2-inch nominal (38-mm actual) thickness or less, no limit for more than 2-inch nominal (38-mm actual) thickness.

B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species.

C. Framing Other Than Non-Load-Bearing Interior Partitions: Construction or No. 2

D. Framing Other Than Non-Load-Bearing Interior Partitions: Any species and grade with a modulus of elasticity of at least 1,500,000 psi (10 350 MPa) and an extreme fiber stress in bending of at least 1000 psi (6.9 MPa) for 2-inch nominal (38-mm actual) thickness and 12-inch nominal (286-mm actual) width for single-member use.

E. Exposed Framing Indicated to Receive a Stained or Natural Finish: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

2.5 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 **and containing no urea formaldehyde**.

1. Extreme Fiber Stress in Bending, Edgewise: 3100 psi (21.3 MPa) for 12-inch nominal-(286-mm actual-) depth members.
2. Modulus of Elasticity, Edgewise: 2,000,000 psi (13 700 MPa).

B. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. Provide I-joists manufactured without urea formaldehyde.
2. Web Material: Either oriented strand board or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
3. Structural Properties: Provide units with depths and design values not less than those indicated.
4. Provide units complying with APA PRI-400, factory marked with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA standard.

C. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.

1. Material: Product made from any combination solid lumber, wood strands, and veneers.
2. Thickness: 1 inch (25 mm).

3. Provide performance-rated product complying with APA PRR-401, rim board grade, factory marked with APA trademark indicating thickness, grade, and compliance with APA standard.

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Cants.
4. Furring.
5. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content.

2.7 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: NES NER-272.

C. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.9 METAL FRAMING ANCHORS

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:

C. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:

1. Alpine Engineered Products, Inc.

2. Cleveland Steel Specialty Co.
3. Harlen Metal Products, Inc.
4. KC Metals Products, Inc.
5. Simpson Strong-Tie Co., Inc.
6. Southeastern Metals Manufacturing Co., Inc.
7. USP Structural Connectors.

D. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

E. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

2.10 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

E. Do not splice structural members between supports, unless otherwise indicated.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
4. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code.
5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code.

6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061200 – STRUCTURAL INSULATED PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes Structural Insulated Panels (SIPs).

B. Related Sections:
   1. Division 06 Section "Rough Carpentry" for dimension lumber items associated with SIPs
   2. Division 06 Section "Glued-Laminated Construction" for framing below roof panels.
   3. Division 06 Section "Shop-Fabricated Wood Trusses" for framing below roof panels.

1.3 DEFINITIONS

A. Structural Insulated Panel (SIPs) system: Consist of oriented strand board (OSB) laminated with structural adhesives to both faces of a termite resistant EPS insulation core, a EPA registered treatment for mold, mildew, and termites, and SIP Manufacturer supplied connecting splines, sealants, and SIP screws.

1.4 REFERENCES

A. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

B. DOC PS2 – Performance Standard for Wood-based Structural-Use Panels.

C. ICC ES AC04 – Acceptance Criteria for Sandwich Panels.

D. ICC ES AC05 – Acceptance Criteria for Sandwich Panel Adhesives.

E. ICC ES AC12 – Acceptance Criteria for Foam Plastic Insulation.

F. ICC ES EG239 – Evaluation Guideline for Termite-Resistant Foam Plastics.

G. AWPA E1 - Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites.

H. AWPA E12- Standard Method of Determining Corrosion of Metal in Contact with Treated Wood.

I. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

J. EPA - Registered products listing.

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide SIPs capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Maximum Deflection Under Design Loads:

a. Roof Panels: Vertical deflection of 1/360 of span under live load only. Vertical deflection of 1/240 of span under any code prescribed load case.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.
1. SIP Code Compliance: Provide ICC ES code report for SIP with evidence of compliance with code requirements as an alternate method of construction. Submit current compliance report number from ICC ES showing conformance to the International Building Code (IBC). Code report shall include compliance with ICC ES AC04 (Sandwich Panels) dated May 2006.
2. EPS Code Compliance: Provide ICC ES code report for EPS foam with evidence of compliance with code. Submit current compliance report numbers from ICC ES with conformance to the International Building Code (IBC). Code report shall include compliance with ICC ES AC12 (Foam Plastic) dated June 2006 and ICC ES EG239 (Termite-Resistance) dated November 2003.
3. Manufacturer's Instructions: SIP Manufacturer's construction detail book and load design charts.

B. Shop Drawings:
1. Submit sealed shop drawings prepared by or under the supervision of a qualified professional engineer for SIPs showing layout, elevations, product components and accessories.
2. Include all required fastening and attachment details.
3. Include product handling, storage and installation instructions.

C. Certificates of Conformance: Issued by a qualified third party testing and inspecting agency indicating compliance with an audited manufacturing quality control program for SIPs manufacture.

D. Qualifications: Manufacturer and Installer qualifications.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with demonstrated record of manufacturing SIPs panels certified by an accredited Third Party inspection agency.

1. Factory mark each piece SIPs panel with the certification mark of the accredited Third Party Inspection Agency. Place mark on surfaces that will not be exposed in the completed Work.

B. Source Limitations: Obtain all SIPs from one source. All accessories and fasteners to be furnished by the SIP manufacturer.

C. Installer Qualifications: Five years of demonstrated experience in the installation of SIPs.

1.8 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with manufacturer recommendations.

B. SIPs shall be fully supported in storage and prevented from contact with the ground. Stack SIPs on pallets or a minimum of three stickers for every 8 feet of SIP length.

C. SIPs shall be fully protected from weather. Protect against exposure to rain, water, dirt, mud, and other residue that may affect SIP performance. Cover stored SIPs with breathable protective wraps. SIPs shall be stored in a protected area.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Insulated Panels: Provide pressure laminate composite panels utilizing the following components:

1. Expanded polystyrene (EPS) core – EPS insulation complying with CAN/ULC-S701-01, type 1 or ASTM C578-01, Type I. Foam core shall be treated for termite resistance in compliance with ICC-EG239.
2. Oriented strand board (OSB) – Minimum 7/16" thick. An APA performance rating mark shall be identified on the panel, with an Exposure 1 durability rating; and performance in accordance with DOC PS-2 span rating 24/16 or greater.
3. Adhesives – shall be in conformance with ICC ES AC05 – Acceptance criteria for sandwich panel adhesives.
4. Treatment for mold, mildew, and termite resistance meeting the following requirements:
   a. Registered with EPA.
   b. Indoor Air Quality Certified under GEI Standard for Low-Emitting Products.

c. Mold growth: 0 rating, tested to ASTM D3273 for 8 weeks at 77 degrees F and 100 percent relative humidity.
d. Termite resistance: Minimum rating of 7.0, tested to AWPA E-1.
e. Corrosion potential for metals in contact with treated wood: Maximum 2 mils per year, tested to AWPA E12 for minimum of 60 days on aluminum 2024, carbon steel, hot-dip galvanized steel, and G90 galvanized steel.
f. Equivalent lateral resistance and tooth holding capacity as untreated wood.

2.2 Accessories

A. Splines: OSB, block splines, or I-beam for use in joining SIPs shall be supplied by SIPs manufacturer.

B. Fasteners: corrosion resistant SIP screws compatible with SIP system shall be provided by the SIPs manufacturer.

1. Wood Screws for attachment to wood members

C. SIP Sealant: Shall be specifically designed for use with SIPs. Sealant must be compatible with all components of the SIP. Sealant shall be provided by the SIP manufacturer.

D. Dimensional Lumber: SPF, #2 or better, or engineered equivalent unless otherwise required by structural drawings.

E. Vapor Barrier SIP Tape: 40 mil thick, butyl adhesive suitable for indoor use, min. 6 inch wide for use on SIP joints. SIP Tape shall be supplied by the SIP manufacturer.

2.3 Fabrication

A. Sizes: SIPs shall be fabricated in accordance with approved Shop Drawings

B. Thermal Resistance, R-value

1. 6 1/2" (165 mm) thick SIP with R-value of 23 at 75oF (24 at 40oF)

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION

A. General: Erect SIPs true and plumb, and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
   1. Install SIPs to comply with approved Shop Drawings.

B. Fastening:: Fasten SIPs roof panels to framing with manufacturer provided SIPS scremws.

C. Joint Sealants: Install joint sealants at all panel joints per manufacturer's directions as panels are erected.

D. SIP tape: Provide tape on interior surface at all joints between panels.

E. Cutting: Avoid cutting after fabrication. Where field fitting is unavoidable, follow manufacturer recommendations.

3.3 ADJUSTING

A. Remove and replace SIPs which have become excessively wet or damaged.

3.4 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

   1. Roof SIPs: Protect roof SIPs from weather by roofing materials to provide temporary protection at the end of the day or when rain or snow is imminent.
   2. After installation, cover SIPs to prevent contact with water on each exposed SIP edges and faces.

END OF SECTION 061200

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SECTION 061500 - WOOD DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-sawn roof decking.

B. Related Sections:

1. Division 06 Section "Rough Carpentry" for dimension lumber items associated with wood decking.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Standard for Solid-Sawn Wood Decking: Comply with AITC 112.

B. Forest Certification: Provide wood decking produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of wood decking to avoid extended on-site storage and to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 WOOD DECKING, GENERAL

A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Moisture Content: Provide wood decking with 15 percent maximum moisture content at time of dressing.

2.2 SOLID-SAWN WOOD DECKING

A. Decking Species: Douglas fir-larch or Douglas fir-larch North.

B. Decking Nominal Size: 2x6.

C. Decking Grade: Select(ed) Decking or Select Dex.

D. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that will not be exposed to view.

E. Face Surface and Edge Pattern: Vee grooved.

2.3 ACCESSORY MATERIALS

A. Fastener Material: Stainless steel.

B. Sealant: Latex sealant compatible with substrates

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install solid-sawn wood decking to comply with referenced decking standard.

1. Locate end joints for controlled random lay-up.

B. Install laminated wood decking to comply with manufacturer's written instructions.

C. Anchor wood roof decking, where supported on walls, with bolts as indicated.

D. Apply joint sealant to seal roof decking at exterior walls at the following locations:

1. Between decking and supports located at exterior walls.
2. Between decking and exterior walls that butt against underside of decking.
3. Between tongues and grooves of decking over exterior walls and supports at exterior walls.

E. Provide temporary waterproof covering as the Work progresses to protect roof decking until roofing is applied.

END OF SECTION 061500

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wall sheathing.
2. Roof sheathing.
3. Composite nail base insulated roof sheathing.
4. Building paper.
5. Building wrap.
6. Sheathing joint-and-penetration treatment.
7. Flexible flashing at openings in sheathing.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

B. Research/Evaluation Reports: For the following:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Cement Board
4. Foam-plastic sheathing.
5. Building wrap.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Plywood.
2. Oriented strand board.
3. Particleboard underlayment.
4. Hardboard underlayment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PANEL PRODUCTS, GENERAL

A. Plywood: DOC PS 1, unless otherwise indicated.

B. Oriented Strand Board: DOC PS 2.

C. Cementitious Fiber-Mat Reinforced Sheathing: ASTM C 1325, ANSI A118.9, cementitious backer.

1. Product: Subject to compliance with requirements, provide DUROCK Brand Cement Board by United States Gypsum Company.
2. Type and Thickness: 5/8 inch]thick.
3. Size: 48 by 96 inches.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA C9.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat all plywood, unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Comply with performance requirements in AWPA C27.

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, High Temperature (HT) for roof sheathing and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Application: Treat all plywood, unless otherwise indicated.

2.4 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural sheathing.

B. Cementitious Fiber-Mat Reinforced Sheathing

C. Oriented-Strand-Board Wall Sheathing: Exposure 1, Structural I sheathing.

2.5 ROOF SHEATHING

A. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.

2.6 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

A. Vented, Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: Rigid, cellular, polyisocyanurate thermal insulation complying with ASTM C 1289, Type II, Class 1, with oriented strand board adhered to spacers on one face.

1. Polyisocyanurate-Foam Thickness: 4 inches (102 mm).
2. Oriented-Strand-Board Nominal Thickness: 5/8 inch (15.9 mm).

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated.

1. For wall and roof sheathing panels, provide fasteners with corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

B. Wood Screws: DUROCK Brand Wood or USG Sheathing WF screws [1-1/4 inch] [1-5/8 inch] [2-1/4 inch] with corrosion-resistant coating.

C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: DUROCK Brand Steel or USG Sheathing SF steel drill screws [1-1/4 inch] [1-5/8 inch] [2-1/4 inch] with corrosion-resistant coating.

1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.8 WEATHER-RESISTANT SHEATHING PAPER

A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

B. Building Wrap: ASTM E 1677, Type I air retarder, with flame-spread and smoke-developed indexes of less that 25 and 450, respectively, when tested according to ASTM E 84, UV stabilized and acceptable to authorities having jurisdiction.
1. Products: Subject to compliance with requirements, provide Tyvek StuccoWrap by DuPont (E. I. du Pont de Nemours and Company).

C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.9 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing Board: Elastomeric silicone joint sealant recommended by sheathing manufacturer.

B. Sealant for Glass-Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, and recommended by tape and sheathing manufacturers.

C. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, of type recommended by sheathing and tape manufacturers.

D. Sheathing Tape for Foam-Plastic Sheathing: Tape recommended by sheathing manufacturer.

2.10 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use indicated by manufacturers of both adhesives and panels.

B. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than **0.025 inch** (**0.6 mm**).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

B. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that exclude exterior moisture.

C. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."

1. Comply with "Code Plus" installation provisions in guide referenced in paragraph above.

B. Fastening Methods: Fasten panels as indicated below:

1. Combination Subfloor-Underlayment:

a. Glue and nail to wood framing.
b. Screw to cold-formed metal framing.

2. Wall and Roof Sheathing:

a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
b. Screw to cold-formed metal framing.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with ASTM C 1280, GA-253 and manufacturer's written instructions.

1. Fasten sheathing to wood framing with [nails] [screws].
2. Fasten sheathing to cold-formed metal framing with screws.
3. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
4. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

C. Horizontal Installation: Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.4 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

A. General: Cover sheathing with weather-resistant sheathing paper as follows:

1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap, unless otherwise indicated.

B. Building Paper: Apply horizontally with a 2-inch (50-mm) overlap and a 6-inch (150-mm) end lap; fasten to sheathing with galvanized staples or roofing nails.

C. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.5 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed tape in sealant. Apply sealant to exposed fasteners. Seal other penetrations and openings.
3. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

3.6 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturers written instructions.

1. Lap seams and junctures with other materials at least 4 inches (100 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
2. Lap flashing over weather-resistant building paper at bottom and sides of openings.
3. Lap weather-resistant building paper over flashing at heads of openings.
4. After flashing has been applied, roll surfaces with a hard rubber or metal roller.

3.7 PROTECTION

A. Paper-Surfaced Gypsum Sheathing: Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant sheathing paper securely fastened to framing. Apply covering immediately after sheathing is installed.

END OF SECTION 061600

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Wood roof trusses.
2. Wood truss bracing.
3. Metal truss accessories.

B. Related Sections include the following:

1. Division 06 Section "Sheathing" for roof sheathing.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

B. TPI: Truss Plate Institute, Inc.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated.
2. Maximum Deflection Under Design Loads:

a. Roof Trusses: Vertical deflection of 1/360 of span.

1.5 SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer. Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
5. Show splice details and bearing details.
6. 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. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

D. Qualification Data: For metal-plate manufacturer and fabricator .

E. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

F. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Metal-plate connectors.
2. Metal truss accessories.

1.6 QUALITY ASSURANCE

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

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

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-

party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. *Source Limitations for Connector Plates: Obtain metal connector plates from a single manufacturer.*

D. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

A. *Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading* agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an

agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S.
3. Provide dry lumber with 15 percent maximum moisture content at time of dressing.

B. Grade and Species: For truss chord and web members, provide dimension lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

C. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 06 SectionRough Carpentry.

2.2 METAL CONNECTOR PLATES

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. Alpine Engineered Products, Inc.
2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
3. CompuTrus, Inc.
4. Eagle Metal Products.
5. Jager Building Systems, Inc.
6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
7. Robbins Engineering, Inc.
8. TEE-LOK Corporation; a subsidiary of Berkshire Hathaway Inc.
9. Truswal Systems Corporation.

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

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

2.3 FASTENERS

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

1. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

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

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.4 METAL TRUSS ACCESSORIES

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

1. Cleveland Steel Specialty Co.
2. Harlen Metal Products, Inc.
3. KC Metals Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. Southeastern Metals Manufacturing Co., Inc.
6. USP Structural Connectors.

C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

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

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.6 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

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

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

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

PART 3 - EXECUTION

3.1 INSTALLATION

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

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

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

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

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.

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

1. Anchor trusses to girder trusses as indicated.

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

1. Install bracing to comply with Division 06 SectionRough Carpentry.

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

K. Do not cut or remove truss members.

L. Replace wood trusses that are damaged or do not meet requirements.

1. Do not alter trusses in field.

3.2 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 061753

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SECTION 061800 - GLUED-LAMINATED CONSTRUCTION

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 framing using structural glued-laminated timber.

B. Related Sections:

1. Division 06 Section "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.
2. Division 06 Section "Structural Insulated Panels" for roofing panels.

1.3 DEFINITIONS

A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 SUBMITTALS

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

1. Include data on lumber, adhesives, fabrication, and protection.

B. Shop Drawings:

1. Show layout of structural glued-laminated timber system and full dimensions of each member.
2. Indicate species and laminating combination, adhesive type, and other variables in required work.
3. Include large-scale details of connections.

C. Samples: Full width and depth, 24 inches long, showing the range of variation to be expected in appearance of structural glued-laminated timber.

D. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide factory-glued structural units produced by an AITC-licensed firm.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark. Place mark on surfaces that will not be exposed in the completed Work.

B. Quality Standard: Comply with AITC A190.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with AITC 117.
1. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
2. Provide structural glued-laminated timber made with wet-use adhesive complying with ASTM D 2559.

a. Use adhesive that contains no urea-formaldehyde resins.

B. Species and Grades for Structural Glued-Laminated Timber: Southern pine that complies with structural properties indicated.

C. Species and Grades for Beams and Rafters:
1. Species and Combination Symbol: Southern pine, 24F-V5.

D. Species and Grades for Columns and Truss Members:

1. Species and Combination Symbol: Southern pine, 50.

E. Appearance Grade: Architectural , complying with AITC 110.

F. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

G. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.2 TIMBER CONNECTORS

A. General: Unless otherwise indicated, fabricate from the following materials:

1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.

B. Fabricate beam seats from steel with 3/8-inch bearing plates, 3/4-inch- diameter-by-12-inch- long deformed bar anchors, and 0.239-inch side plates.

C. Fabricate strap ties from steel, sized as indicated..

D. Provide bolts, 3/4 inch unless otherwise indicated, complying with ASTM A 307, Grade A; nuts complying with ASTM A 563; and, where indicated, flat washers.

E. Provide shear plates, 2-5/8 inches in diameter, complying with ASTM D 5933.

F. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123/A 123M or ASTM A 153/A 153M.

2.3 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

1. Dress exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of structural glued-laminated timber.

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

3.2 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb, and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Lift with padded slings and protect corners with wood blocking.
2. Install structural glued-laminated timber to comply with Shop Drawings.
3. Install timber connectors as indicated.

B. Framing Built into Masonry: Provide 1/2-inch clearance at tops, sides, and ends of members built into masonry; bevel cut ends 3 inches; and do not embed more than 4 inches unless otherwise indicated.

C. Cutting: Avoid cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

3.3 ADJUSTING

A. Repair damaged surfaces after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.4 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work specified in Division 09. Retain wrapping where it can serve as a painting shield.

END OF SECTION 061800

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior finish carpentry for the exterior siding.

1.2 SUBMITTALS

A. Product Data: Submit product data for each factory-fabricated product. Indicate component materials, dimensions, profiles, and include construction and application details.

B. Samples: Submit samples of wood siding specified showing construction, each finish, and color selected. Sample size shall be 24" long.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage a qualified Installer to assume undivided responsibility for exterior finish carpentry specified in this section. The installer shall have had a minimum of 15 years successful experience in the custom fabrication and installation of exterior finish carpentry comparable to that shown and specified.

B. Standards: Fabricate and install all exterior finish carpentry in accordance with the applicable provisions and recommendations of the governing codes and the following unless more stringent requirements are specified or shown:

1. National Lumber Grades Authority (NLGA).

2. West Coast Lumber Inspection Bureau (WCLIB).

3. Western Red Cedar Lumber Association (WRCLA).

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

1. Siding planks shall be individually stacked horizontally at the job site, vertically separated by 1" nonstaining separators for a week to 10 days prior to installation to match job site moisture conditions.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed.

1.6 PRE-INSTALLATION COORDINATION MEETING

A. Meet at the project site, prior to installation of the exterior finish carpentry, to review the substrate preparation, installation and coordination with other trades, special details and conditions, and other topics related to the exterior finish carpentry. The pre-installation meeting shall include the Architect, the Construction Manager, carpenter, and any subcontractors affected by the exterior finish carpentry installation.

PART 2 - PRODUCTS

2.1 LUMBER

A. General:

1. Lumber Standards: In addition to requirements shown and specified, comply with applicable provisions for grading and workmanship of the NLGA, WCLIB, and WRCLA. Where standards conflict, the more stringent shall apply.

2. Mill glazing and fine mill surfacing not permitted in cedar.

3. Grade Marking: Each piece of lumber shall be grade-marked on the back of boards, identifying mill and grading agency and signifying that lumber conforms to type, size, grade and seasoning provisions of the rules under which it was graded.

2.2 STANDING AND RUNNING TRIM

A. Lumber Trim for Clear Finish:
1. Species and Grade: Western red cedar, Grade A.
2. Maximum Moisture Content: 19 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.
4. Face Surface: Saw textured.

B. Lumber Trim for Opaque-Stained Finish:
1. Species and Grade: Western red cedar, Grade A.
2. Maximum Moisture Content: 19 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.
4. Face Surface: Saw textured.

C. Moldings for Clear Finish: WMMPA WM 4, N-grade wood moldings, without finger jointing. Made from kiln-dried stock to patterns included in WMMPA WM 12.

1. Species: Western red cedar.

2.3 LUMBER SIDING

A. Provide kiln-dried lumber siding complying with DOC PS 20..

B. Species and Grade: Grade A Western Red Cedar (Thuja plicata); NLGA, WCLIB, or WWPA.

C. Pattern and Moisture Content: Board and Batten and Lap siding, saw textured surfaced, ½ by 6 inch, measured on the face at 15 percent moisture content.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners: 7d sized nails; ring-threaded or spiral threaded shank, blunt point, type 304 stainless steel to resist black staining and streaking, sized for minimum 1-1/2" penetration into wood sheathing. Copper nails are not permitted. Smooth shanks not permitted.

B. Flashing: Stainless steel, comply with requirements in Section 07620, "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

C. Sealants: Typical Exterior Wall Silicone Sealant, refer to Section 07920, JOINT SEALANTS.

D. Wood Blocking: Refer to Section 061000, MISCELLANEOUS ROUGH CARPENTRY.

E. Sheathing: Refer to Section 061600. SHEATHING

F. Stone Veneer Walls: Refer to Section 047300, MANUFACTURED STONE VENEER.

G. Metal Roofing: Refer to Section 074113, METAL ROOF PANELS.

2.5 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches (125 mm), except members with ends exposed in finished work.

B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

C. Do all fabrication with provision for scribing as required to meet built-in conditions.

D. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, open joints, or other defects affecting serviceability or appearance.

2.6 SHOP PRIMING

A. Apply the complete finishing of all exterior finish carpentry items in the shop by applying finish to all sides, edges and ends after the wood has reached a climate balance for on-site conditions and before it is nailed in place.

B. Special Materials: Alternate methods and products may be used at the option of the Contractor to achieve the same finish, subject to the acceptance of the Architect.

C. Sandpaper smooth surface textured woodwork to remove roughness, loose edges, slivers or splinters and then brush to remove dust. Wash off grease or dirt with an appropriate cleaner.

D. Finish Application: Production finish wood with the following materials which have been specifically formulated to be applied to redwood and cedar substrates. Apply in strict accordance with the manufacturer's instructions.

1. Benjamin Moore "Moorwood Alkyd Deck & Siding Finish" in one custom color to be selected by the Architect; apply one coat.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify all sheathing, blocking, flashings and air retarders have been installed prior to installing exterior finish carpentry. Refer to Sections 061000 MISCELLANEOUS ROUGH CARPENTRY, and 061600 SHEATHING.

B. Prime lumber to be painted, including both faces and edges. Cut to required lengths and prime ends.

3.2 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

B. Install exterior finish carpentry level, plumb, true, and straight with no distortions, and with no variations in flushness of adjoining surfaces. Shim as required with concealed shims.

1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

2. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3. Anchor exterior finish carpentry to sheathing and blocking directly attached to substrates. Secure to blocking with countersunk, fasteners and blind nailing as required for complete installation. Fill countersunk exposed fastener heads flush with exterior finish carpentry.

3.3 SOFFIT INSTALLATION

A. Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for soffit panel condition indicated.

B. Fastening Methods: Cover soffit support framing with plywood soffit panels and fasten to supports with power driven, screw fasteners spaced 6" o.c. along supported panel edges and 12" o.c. for intermediate supports.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install flat grain lumber with bark side exposed to weather.

B. Install corner, door, window, and soffit trim and rake moldings before installing the vertical siding.

C. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary.

1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

D. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

E. Unless otherwise indicated, countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.

3.5 SIDING INSTALLATION

A. Vertical Board and Batten Lumber Siding: Apply siding vertically direct to vapor retarder covered sheathing and fasten to sheathing. Start at one corner and work towards the opposite corner. Use a level or plumb line to ensure that the first board is installed vertically. Fasten boards and battens independently to sheathing, do not nail through two thicknesses of vertical siding. Vertical boards shall be spaced to permit a 1 inch overlap of batten onto each board face plus a gap for nailing battens directly to sheathing without the nail passing through vertical board.

1. The square long edge of the boards shall be beveled to ensure a neat fit to the previously installed corner board, window, and door standing trims.

2. Butt ends of siding boards up against soffit running trim. Space ends of siding boards ¼" above metal L flashing at horizontal stone sills.

3. Nails shall be driven with care. Heavy nailing distorts the wood and may cause splitting. Near edges and near ends, nail holes shall be pre-drilled to avoid splitting.

4. Use full length boards to avoid horizontal joints to the greatest extent possible. If horizontal joints are necessary, bevel the ends of abutting joints so that water that penetrates drains away from the building. Secure ends with 2 nails to sheathing.

5. Nail each board and batten at 16" o.c. and at the top and bottom ends of the board or batten being fastened.

3.6 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 PROTECTION

A. Protect installed products from damage during construction.

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SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes interior architectural woodwork for the following applications:
   1. Standing and running trim.
   2. Wood cabinets.
   3. Plastic-laminate cabinets.
   4. Plastic-laminate countertops.
   5. Wall-hung, adjustable open shelving.
   6. Closet rods and shelves.
   7. Frames and jambs.
   8. Shop finishing of woodwork.

B. Interior architectural woodwork includes wood furring, blocking shims, and hanging strips, unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

A. Product Data: Submit product data for each material and product specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

   1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Submit shop drawings showing locations of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components. Elevations shall be drawn at a scale of not less than 1/2" = 1'-0". Details shall be drawn at a scale of not less than 3" = 1'-0".

   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   2. Show locations and sizes of cutouts and holes for plumbing, electrical, computer and telephone equipment and other items installed in architectural woodwork.
   3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples: Submit samples of the following:

   1. Five (5) veneer leaves representative of and selected from each flitch to be used for transparent-finished woodwork.
   2. Three 12" x 12" sample sets containing a minimum of 2 or more samples of transparent finished wood-veneer and plastic laminate veneered panel products, fabricated from each core product, for each veneer specified and demonstrating the proposed full range of appearance characteristics to be expected in completed work. Include at least one face-veneer seam in each sample.
   3. Lumber and panel products for transparent finish, for each species and cut, finished on one side and one edge. Furnish lumber in 12" lengths, furnish panel samples in 12" squares.

4. Lumber and panel products with shop-applied opaque finish, for each finish system and color, with exposed surface finished. Furnish lumber in 12" lengths, furnish panel samples in 12" squares.
5. Thermoset decorative-overlay surfaced panel products, for each type, color, pattern, and surface finish.
6. Solid-surfacing materials, 6 inches (150 mm) square.
7. Cabinet Locks: Three samples of each type.
8. Metal Trim Shapes: Three samples of each type and finish, 12" long.
9. Submit samples of each type of door specified showing construction and finishes selected. Samples shall be 12" x 12" corner section.
10. Submit samples of stainless steel glass rosette cap assemblies in each finish specified.
11. Glass and Acrylic Panels: 12" x 12" of each type specified.
12. Solid Laminate (Trespa) Flat Panels: Submit three 12" x 12" sample sets containing a minimum of 2 or more samples of solid laminate panel products, for each finish specified and demonstrating the proposed full range of appearance characteristics to be expected in completed work.
13. Solid Laminate (Trespa) Panel Corner Construction Samples: Submit three minimum 18 w. x 18" d. by 24 inches h, samples demonstrating the outside corner construction of solid laminate panels. Show vertical-edge corner construction, top, and bottom construction. Include fasteners, reveals and trim closures.

1.3 QUALITY ASSURANCE

A. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer - acceptable to the Architect - to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation. The manufacturer shall have had a minimum of 15 years successful experience in the custom fabrication and installation of architectural woodwork comparable to that shown and specified, be a member of the AWI, maintain an organized quality control program, perform its own in-house veneer lay-up work, and who retains facilities with sufficient capacity and quality to produce the required architectural woodwork without causing delay to the project.

B. Quality Standard: Fabricate and install all architectural woodwork in accordance with the applicable requirements of AWI's "Architectural Woodwork Quality Standards" 8th Edition Version 1.0 unless more stringent requirements are specified or shown.

C. Fire Performance Characteristics: Provide materials identical to those tested for the following fire performance characteristics per ASTM test methods indicated by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify treated lumber with classification marking of inspecting and testing organization in the form of separable paper label or, where required by authorities having jurisdiction, of imprint on lumber surfaces that will be concealed from view after installation.Surface Burning Characteristics: Not exceeding a flame spread of 25, and smoke developed of 50 when tested per ASTM E84 for 30 minutes.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions" Article.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

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

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

1.7 PRE-INSTALLATION COORDINATION MEETING

A. Meet at the project site, prior to installation of architectural woodwork, to review the substrate preparation, installation and coordination with other trades, special details and conditions, and other topics related to the architectural woodwork. The preinstallation meeting shall include the Architect, the Contractor, architectural woodworker, and any subcontractors affected by the architectural woodwork installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified.

B. Lumber Standards: Comply with applicable provisions for grading and workmanship of AWI Quality Standards, Sections 100-T-1, 100-T-4, 100-T-5, Grade I and the requirements shown and specified, where standards conflict the more stringent shall apply. Provide lumber surfaced 4 sides (S4S) and fabricated to profiles shown. All lumber shall be kiln dried to the moisture content indicated in AWI Section 100-T-11.

1. Furring, Blocking, Shims: No. 1 Common; Southern Pine.
2. Solid Hardwood for Opaque Finish **[(WD-)]**: Plain sawn Yellow Poplar, free from checks, splits, sound knots.
3. Solid Hardwood for Transparent Finish**[(WD-)]**: Matching each of the Architect's veneer samples; refer to Finish Schedule on the drawings for each specie.

C. Wood Veneers:

1. Species, Matching, and Cut for Transparent Finish: Complying with AWI 1500 and the following:

   a. [**(WD-)**]Specie and figuring as indicated on the finish schedule, book matched unless otherwise indicated, minimum 5"width leaves, complying with HPVA HP-1, Grade AA, matching Architect's sample.

   b. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

D. Wood Panel Products:

1. Medium-Density Fiberboard: Comply with ANSI A208.2, Density Classification Interior MD minimum 45 pcf density except that minimums for screw holding capacity on face and edge shall be 225 pounds and 300 pounds respectively; minimum ¾" thick, edged and faced as specified, fabricated with binder containing no urea formaldehydes.

   a. Panel Source International; Purekor Platinum Grade MDF

   b. SierraPine Ltd.; Medite II or Medex.

2. Medium Density Particleboard: Comply with ANSI A208.1, Grade M-2-Exterior Glue composed of phenolic resins and waxes, with a minimum 45 pcf density; minimum 3/4" thick, internal bond of 170 psi, edge screw pull out of 250 pounds, face screw pull out of 350 pounds, Class 3 or C flammability per ASTM E84, edged and faced as specified and manufactured from 100% post industrial recycled woods and resins free of urea-formaldehyde..

   a. Panel Source International; Purekor Particleboard Plus

   b. Resin-Core-I by Rodman Industries.

3. Hardboard: AHA A135.4.
   a. Panel Source International; FSC Certified + Formaldehyde Free Plywood Veneer Core
   b. Panel Source International; FSC Certified + Urea Formaldehyde Free Paint Grade Good 2 Sides Plywood
   c. Columbia Forest Products; FSC Certified plywood with NAF adhesive technology.

E. Thermoset Decorative Overlay (Melamine): Particleboard or medium-density fiberboard with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

1. Types: As indicated in the Finish Schedule on the drawings.

F. Glass: Clear tempered float glass, complying with ASTM C1036, Type I, Class 1, Quality q3, and ASTM C1048 Kind FT, thickness as indicated.

1. Prior to tempering, cut glass to required sizes and profiles as determined by accurate measurement of supporting standoff hole locations.

2. Hole Cutting: Unless otherwise recommended by the glass manufacturer, comply with the requirements of ASTM C1048, Article 7.8 for hole placement, minimum hole diameter, and dimensional tolerances of holes and this specification. Unless otherwise

recommended by the glass manufacturer locate holes not less than 4" from glass edges, hole diameter shall be at least 1/8" larger than the shank of the screw fastener and screw sleeve spacers used for the rosette assemblies. Chips and flakes at hole edges shall not be permitted, and the inner surfaces of holes shall be smooth polished to match glass panel edges.

3. Edge Treatment: All glass edges shall have an arrised edge profile (small bevel of width not exceeding 1/16" at an angle of approximately 45 degrees to the surface of the glass) with a polished (surface is reflective in appearance similar to the major surface of glass) surface.

G. High-Pressure Decorative Laminate (PL-): Complying with NEMA LD 3 for Horizontal General Purpose Grade (HGS) typically and Vertical General Purpose Grade (VGS) where specified. Nominal thickness for HGS and VGS laminates to be 0.048" +/- 0.005" and 0.028" +/- 0.004" respectively. Where high pressure decorative laminate is indicated to be faced with aluminum, provide aluminum sheet goods specifically made for laminating to vertical MDF and particleboard substrates in sheet thickness of 0.025" +/- 0.002".

1. Types: As indicated in the Finish Schedule on the drawings.

   a. Provide factory applied protective peel coat to prevent surface damage during fabrication and handling of aluminum faced decorative laminates. Remove protective peel coat after installation in accordance with the manufacturers recommendations. If the film is left in place after installation, exposure to direct sunlight for a prolonged period may cause a paste residue and create other problems.

2. Backing sheets: Non-decorative, high pressure laminate, NEMA LD3, Grade, types and thickness to match face sheets and equalize pull.

H. Stone: Provide stone of soundness (hardness and density), texture, graining finish, crystal patterning, color and tone matching the sample in the Architect's office (and subject to the Architect's approval). Stone shall be sound and free from defects which will impair strength durability, finish appearance, and is supplied from a single quarry source with sufficient capacity, to satisfy the total requirements of the project. Waxing and sticking will not be permitted.

1. *Specie, Finish and Thickness:*

   a. Specie and Finish: As indicated in the Finish Schedule on the drawings. Stone tops shall be sealed on all surfaces with materials compatible with the stone and which do not effect their sheen or color.

   b. Thickness: Minimum 3/4".

I. *Adhesives, General:* Use only low emitting VOC adhesives which leave no glue lines on finished surfaces of architectural woodwork. Do not use adhesives that contain urea formaldehyde.
   1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Wood Glues: 30 g/L.
      b. Contact Adhesives: 250 g/L.

J. Solid Laminate: Solid composite panels fabricated of material specifically designed for casework. All panel surfaces shall be electron beam cured to prevent damage from cleansing agents such as graffiti removers. Surfaces shall offer protection against 10% hydrochloric acid, 10% phosphoric acid, 30% hydrogen peroxide, 25% caustic soda, 100% paint thinner and 100% methyl ethyl ketone without functional or aesthetic damage to the surface. All surfaces and edges shall be non-porous.

1. Core: Solid black.

2. Physical Properties:

   a. Modulus of elasticity: 1,500,000-psi minimum.
   b. Shear strength: 2000-psi minimum.
   c. Compressive strength: 24,000-psi minimum.
   d. Weight: 93 lbs. per cubic foot maximum.
   e. Tensile strength: 13,000-PSI, minimum.
   f. Flexural strength: 16,000-PSI minimum.
   g. Surface Impact Resistance: 9 lb.
   h. Scratch Resistance: 0.8 lb.
   i. Specific Gravity: 87 lbs. per cubic foot, minimum.
   j. Dimensional Stability: 0.03 in/ft, maximum.
   k. Water Absorption: 3% by weight, maximum.

3. Thickness, Products and Manufacturer: Trespa Virtuon, thickness, colors and surface texture as indicated in the Finish Schedule on the drawings.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.

1. Do not use treated material that does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber or panel products.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
3. Treat only door subframing, blocking and furring items.

B. Fire-Retardant-Treated Lumber and Plywood: Materials impregnated with fire-retardant chemical formulations to comply with AWPA C20 (lumber) and AWPA C27 (plywood), Interior Type A. Kiln-dry material after treatment to levels required for untreated woodwork.
1. Panel Source International; Pyroblock FSC Certified Plywood Plus.

C. Fire-Retardant Particleboard: Panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
1. Panel Source International; Pyroblock Particleboard Plus.

D. Fire-Retardant Fiberboard: ANSI A208.2 medium-density fiberboard panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

1. Panel Source International; Pyroblock Platinum Grade MDF.

2.3 ACCESSORY MATERIALS

A. Frameless Concealed Hinges For Cabinet Doors (European Type): Concealed all-metal furniture hinges similar to Grass 3000 Series or equal with free swing only at cabinet doors that are provided with magnetic latches, adaptable or engineered for 35 mm hinge cup boring pattern, with minimum 165 degree opening angle, 3 dimensional hinge having adjustments located in the steel hinge arm, steel or die-cast zinc hinge cups, and plastic insertion dowels to receive hinge screws. Automatic closing shall engage only in the last 10 degrees of swing. All hinge pins and linkages shall be hardened. Complying with BHMA A156.9, B01602. Bright nickel finish (US15).

1. Hinge Quantity: Provide hinge quantity as recommended by hinge manufacturer based on cabinet door width, weight, thickness, door material, and hinge cup selection.

B. Wire Pulls: Back mounted, 4 inches (100 mm) long, 5/16 inches (8 mm) in diameter fabricated from satin finished stainless steel (US32D), complying with BHMA A156.9, B52011, unless otherwise indicated.

C. Edge Pulls: Full mortised, solid, bronze or brass door edge pull, with 1/2 inch (13-mm) finger clearance, ¼" diameter roll diameter, having nominal overall roll length dimension of 3 inches long, with backbend drilled and countersunk to receive 3 screw fasteners; form for full mortise application; satin finished chrome (US26D); one of the following:

1. SR Style Edge Pull; Tydix. www.tydix.com.

2. DP3A Tab Drawer Pull; Doug Mockett and Co., Inc.

D. Catches: Magnetic, complying with BHMA A156.9, B03141 for single doors and B03161 for double doors.

1. For Single Doors:

a. CD41 Single Magnetic Cabinet Catch; Stanley Commercial Hardware.

2. For Double Doors:

a. 901; Rockwood Manufacturing Company.
b. CD45 Double Magnetic Cabinet Catch; Stanley Commercial Hardware.

E. Cabinet Shelf Rests: Nickel plated 7 mm diameter shelf support pegs in brass sockets, complying with BHMA A156.9, B04013. (Hafele 282.01.701 x 282.50.704).

F. Closet Rods and Flanges: 1-1/2" diameter, satin finished chrome plated steel or satin finished stainless steel with matching end flanges.

G. Adjustable Shelf Standards and Brackets for Wall-Hung Open-Shelving:

1. Standards: Model No. 87ANO Extra Heavy Duty 87-187 Series; **[24 inch (600 mm)] [36 inch (900 mm)] [48 inch (1200 mm)] [60 inch (1500 mm)] [72 inch (1800 mm)] [84 inch (2100 mm)] [96 inch (2400 mm)] [144 inch (3650 mm)]** lengths **[as indicated]**, by Knape and Vogt.

2. Brackets: **[Model No. 186 LL ANO for 8- and 10-inch (200- to 250-mm)] [Model No. 187 LL ANO for 12- to 24-inch (300- to 600-mm)]** deep shelves by Knape and Vogt.
3. Shelf Rests: Model No. 210 ANO End Rest and Model No. 211 ANO Center Rest with Model No. 129 RUB Rubber Cushions.

H. Drawer Slides:

1. Pencil Drawer Slides: Similar to Accuride 2006 having 3/4 extension carburized steel ball bearing, side mounting, 45 lbs. capacity medium duty load rating, cold rolled steel slide members and ball retainers, bright electro zinc plate finish.
2. Drawers less than 4" deep: Similar to Accuride 7432 having full extension carburized steel ball bearing, side mounting, 100 lb. capacity medium duty load rating, cold rolled steel slide members and ball retainers, cushioned in and outstops, detent-in, progressive action, positive stop, bright electro zinc plate finish.
3. Drawers greater than 4" but less than 8" deep: Similar to Accuride 7432 having full extension carburized steel ball bearing, side mounting, 100 lb. capacity medium duty load rating, cold rolled steel slide members and ball retainers, cushioned in and outstops, detent-in, progressive action, positive stop, bright electro zinc plate finish.
4. Drawers greater than 8" deep: Similar to Accuride 4032 having full extension carburized steel ball bearing, rail mounting, 150 lb. capacity heavy duty load rating, cold rolled steel slide members and ball retainers, cushioned in and outstops, detent-in, progressive action, positive stop, bright electro zinc plate finish.
5. Refuse Cabinets: Similar to Accuride 3600-201 having full extension carburized steel ball bearing, bottom mounting, 175 lb. capacity heavy duty load rating, cold rolled steel slide members and ball retainers, cushioned in and outstops, progressive action, positive stop, bright electro zinc plate finish.

I. Silencers: Provide rubber silencers on jamb and/or head and sill strike areas of all cabinet doors and drawers, 2 for paired doors, and 3 for single doors. Silencers shall be approximately 1/4-inch (6.4-mm) diameter, color compatible with adjacent finish.

J. Door and Drawer Locks: All cabinet doors and drawers shall be furnished with locks. Finish exposed portions of locks to match cabinet pull finish. Furnish 2 keys with each lock and key all locks inside one room alike and provide masterkey for all locks in project.

1. Drawers: Provide one of the following lock assemblies:

   a. Cam lock similar to Hafele 235.12.261, chrome plated, with Offset Cam 219.13.9xx, sized to fit opening.
   b. Cam lock similar to Hafele 235.12.221, chrome plated, with surface-mounted strike 251.60.703.

2. Single Doors: Provide one of the following lock assemblies:

   a. Cam lock similar to Hafele 235.12.261, chrome plated, with Offset Cam 219.13.9xx, sized to fit opening.
   b. Cam lock similar to Hafele 235.12.221, chrome plated, with surface-mounted strike 251.60.703.

3. Pairs of Doors: Provide the following:

   a. At inactive leaf, Furniture bolt similar to Hafele 252.02.644, polished chrome, with strike 251.60.703.
   b. At active leaf, provide Single Door lock assembly.

K. Grommets for Cable Passage through Countertops: 2-1/2-inch (64-mm) metal grommets and matching plastic caps with slot for wire passage.

1. Product: Subject to compliance with requirements, provide "**MM** series" by Doug Mockett and Co., Inc.

L. Exposed Hardware Finishes: Unless otherwsie specified above, or on the drawings, all exposed portions of the woodwork hardware shall comply with BHMA A156.18 for BHMA finish number indicated.

1. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base.
2. Bright Brass, Clear Coated: BHMA 605 for brass base; BHMA 632 for steel base.
3. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
4. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.

M. Stainless Steel Trim: Custom fabricate stainless steel trim shapes to the sizes, shapes and profiles shown from the following materials. Provide in standard commercial tempers and hardness, as required for fabrication, strength and durability from Type 304 alloy. Form exposed work true to line and level, with flush surfaces and accurate angles. Ease exposed edges to a radius of approximately 1/32" radius, unless otherwise shown. Miter exposed corner joints and machine fit to a hairline joint. All sheet goods shall be provided finished one side only. Finish designation shown on the drawings are NAAMM nomenclature.

1. Sheet and Plate: ASTM A666.
2. Bar Stock: ASTM A276.
3. Pipe: ASTM 312, Grade TP 304.
4. Tubing: ASTM A 554, Grade MT 304.
5. Rosettes for Capping Brushed Stainless Steel Standoffs at Glass Tops: Custom fabricate rosettes from satin finished stainless steel materials. All fasteners shall be concealed. Fastener for joining rosette assemblies shall be of a type, design, and size as recommended by the glazier for the application shown and specified. Isolate glass from stainless steel using clear plastic cushions sized to fit under the rosettes.

N. Stainless Steel Trim Finish: Provide the following mechanical finish to the exposed surfaces of the fabricated work to the extent indicated (NAAMM nomenclature), with texture and reflectivity as required to match the Architect's sample.

1. No. 4 (bright directional polish).

O. Steel Reinforcing: Carbon steel shapes, tubes and plates complying with ASTM A36 (shapes and plates), and ASTM A500 or A501 (for tubes).

1. Shop Primer for Concealed Steel Reinforcing: Provide fast curing, lead and chromate free, universal modified alkyd primer complying with performance requirements in FS TT-P-664.

2. Electrodes for Concealed Steel Reinforcing: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded.

P. Door Hardware: At full sized doors, provide door hardware as scheduled under Section 087100 DOOR HARDWARE.

Q. Hanging (Zee Clip) Strips: Extruded aluminum zee type interlocking clips; type, size and quantity for the condition of use.

R. Brushed Aluminum Trim Shapes: Custom fabricate aluminum trim shapes to the sizes, shapes and profiles shown from the following materials. Provide in standard commercial tempers and hardness, as required for fabrication, strength and durability. Form exposed work true to line and level, with flush surfaces and accurate angles. Miter exposed corner joints and machine fit to a hairline joint. Finish designations are NAAMM nomenclature.

1. Plate: Alloy 5005 and ASTM B 209 (ASTM B 209M).
2. Bar Stock: ASTM B 211 (ASTM B 211M).
3. Extrusions: Alloy 6063 and ASTM B 221 (ASTM B 221M).
4. Aluminum Trim Finishes: Provide the following finishes to the exposed surfaces of the fabricated work to the extent indicated (NAAMM nomenclature), with texture and reflectivity as required to match the Architect's sample.

    a. Class II, Clear Anodic Finish: Complying with AA-M10M32A31 for an Architectural Class II, medium satin, clear natural anodized finish.

S. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

T. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

U. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

V. Blind Splines: Specialty devices, as required for tight butt joining, types and size as recommended by woodwork fabricator.

W. Covercaps: Where mortises of fastener heads, or draw downs are exposed (blind holes) in finished work, provide black plastic covercaps.

2.4 FABRICATION, GENERAL

A. General: Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to the maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting. The width of scribe and filler panels shall not exceed ½", or ½" clear dimension from adjacent wall to outside face of cabinet door in a 90 degree position, which ever is greater.

1. Interior Woodwork Grades:

    a. Premium Grade at work to receive wood veneer or bamboo veneer finish.
    b. Custom Grade at all other work.

B. Fabricate woodwork to dimensions, profiles, and details indicated.

1. Reinforcing shown is minimum. Provide additional steel and lumber reinforcing as required to sustain imposed loads and to ensure a rigid assembly.

2. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects affecting serviceability or appearance. Accurately fit all joints, corners and miters. Conceal all fasteners. Make threaded connections up tight so that threads are entirely concealed.

C. Shop cut openings to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.
2. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.5 WOOD CABINETS FOR TRANSPARENT FINISH

A. AWI Type of Cabinet Construction: Flush overlay .

B. Wood Veneered Surfaces:

1. Wood Veneered Species and Matching:

a. Wood Veneer Species: As indicated on the drawings and in the Finish Schedule.
b. Matching:

1) Grain Matching: Run and match grain vertically for drawer fronts, doors, and fixed panels unless otherwise indicated on the drawings..
2) Matching of Veneer Leaves: Book match.
3) Veneer Matching within Panel Face: Center Balanced .
4) Veneer Matching within Room: Provide cabinet veneers in each room and space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.

C. Semiexposed Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.

1. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
2. Drawer Bottoms: Hardwood plywood.

2.6 WOOD CABINETS FOR OPAQUE FINISH

A. AWI Type of Cabinet Construction: Flush overlay.

B. Laminate Cladding for Exposed Surfaces: High-pressure decorative of grade indicated.

1. Horizontal Surfaces Other Than Tops: HGS.
2. Postformed Surfaces: HGP.
3. Vertical Surfaces: VGS.
4. Edges: HGS unless otherwise indicated.
5. Colors, Patterns, and Finishes: As indicated on the drawings and in the Finish Schedule.

C. Materials for Semiexposed Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.

1. Drawer Sides and Backs: Solid-hardwood lumber.
2. Drawer Bottoms: Hardwood plywood.

D. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.7 PLASTIC LAMINATE COUNTERTOPS

A. High-Pressure Decorative Laminate Grade: HGS.

B. Colors, Patterns, and Finishes: As indicated on the drawings and in the Finish Schedule.

C. Edge Treatment: Same as laminate cladding on horizontal surfaces unless otherwise indicated..

D. Core Material at Sinks: Particleboard, or medium density fiberboard made with exterior glue, or exterior-grade plywood.

2.8 FLUSH WOOD PANELING

A. Core Material:

1. Opaque Finished Paneling: Medium density fiberboard.

2. Transparent Finished Paneling: Medium density particleboard or medium density fiberboard.

B. Veneered Surfaces:

1. Veneer Types:

a. Opaque Finished Paneling: Exposed MDF.

b. Transparent Finished Paneling: As indicated on the drawings and in the Finish Schedule.

2. Transparent Finished Panel Matching:

a. Matching of Adjacent Veneer Leaves: Book matched.

b. Veneer Matching Within Panel Face: Center balance match.

c. Panel Matching Method: Match panels to one another within each separate area by the following method:

1) Blueprint sequenced matched panels and components.

C. Edge Detail: Edge veneer banded with continuous hardwood strips matching face veneer. Panel joints to be flush type unless otherwise shown.

2.9 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE AND TRANSPARENT FINISHES

A. General: Complying with AWI 300, fabricated from solid hardwood with scarfed joints, profiles as indicated, finishes as indicated.

B. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

C. Wood Species: Poplar for opaque finishes; solid hardwood plant finished with transparent finished wood veneer in veneer cut as indicated on the drawings to match adjacent transparent finished veneered items.

2.10 CLOSET & UTILITY SHELVING

A. Shelf Material: Medium density fiberboard where indicated to be painted; medium density particle board where indicated for plastic laminate or melamine veneer.

B. Cleats: 3/4-inch (19-mm) solid lumber or thermoset decorative panel.

C. Finishes: As shown and scheduled on the drawings.

2.11 SHOP FINISHING

A. Production finish architectural woodwork at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

B. Priming of interior architectural woodwork with field applied opaque finish required to be performed at fabrication shop are specified in this Section. Refer to Section 099123 "Interior Painting" for finishing opaque finished architectural woodwork.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.
2. Gluing of face veneers shall, where possible, be by the hot plate method; glued surfaces shall be in close contact throughout. Glue stains will not be permitted.
3. Grain of all transparent finished wood shall run in the direction shown, or if not shown, as accepted on the shop drawings.

D. Exposed Surfaces:

1. Transparent Finish:

a. Grade: Premium.
b. AWI Finish System: Catalyzed Vinyl exceeding the performance requirements of AWI Finish System TR-5 for closed grain woods.
c. Staining: Natural to match Architect's sample.
d. Sheen: Match Architect's samples.

2. Opaque Finish:

   a. Grade: Custom.
   b. Color: Match Architect's paint samples.

3. Plastic Laminate Finish: Gluing of plastic laminate surfacing materials shall be by the hot plate method, glued surfaces shall be in close contact throughout. Glue stains shall not be permitted.

E. *Unexposed Wood Finish:* Alkyd type primer-sealer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming before installation.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in this Section for type of woodwork involved.

1. Install woodwork level, plumb, true, with no distortions, and with no variations in flushness of adjoining surfaces. Shim as required with concealed shims.
2. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

B. Anchor woodwork to blocking built in or directly attached to substrates. Secure to blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

C. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.

D. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets without sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.

3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm)

penetration into wood blocking, or hanging strips or with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

E. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Calk space between backsplash and wall with silicone sanitary sealant specified in Division 7 Section "Joint Sealants."

2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.

3. Natural Stone Tops: Refer to Section 096000, INTERIOR STONEWORK.

F. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips, by blind nailing on backup strips, splined connection strips, and associated trim and framing. Do not use face fastening, unless otherwise indicated. Space panels so that reveals are parallel and of widths indicated.

G. Built-in Desks and Credenzas: Install without distortion so that doors, and drawers, fit openings properly and are accurately aligned. Adjust hardware to center doors, and drawers, in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

H. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

1. Anodized aluminum surfaces shall be cleaned with warm water and mild soaps such as those used for hands or dishes. Do NOT use cleaners that contain abrasives, acids or alkalis, as they will mar the surface. Do NOT clean metal face with solvents, paint thinner or adhesive remover. After washing, always wipe the surface completely dry with a soft, clean cloth. Stubborn stains may be removed with a thin, clean oil and dry cloth.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer, that ensures that woodwork will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 064023

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SECTION 071353 - ELASTOMERIC SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Butyl rubber sheet waterproofing.
2. EPDM rubber sheet waterproofing.
3. Molded-sheet drainage panels.
4. Insulation.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Product test reports.

D. Special warranties.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of units required for this Project.

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

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1.5 WARRANTY 279

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.

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

PART 2 - PRODUCTS

2.1 SHEET WATERPROOFING

A. Butyl Rubber Sheet: ASTM D 6134, Type II, 60-mil- (1.5-mm-) thick flexible sheet, unreinforced, formed from isobutylene-isoprene rubber.

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:

a. Carlisle Coatings & Waterproofing Inc.; Sure-Seal Butyl.
b. Approved equal.

B. EPDM Rubber Sheet: ASTM D 6134, Type I, 60-mil- (1.5-mm-) thick flexible sheet, unreinforced, formed from EPDM.

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:

a. Carlisle Coatings & Waterproofing Inc.; Sure-Seal EPDM.
b. Approved equal.

2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Concealed Sheet Flashing: Same material, construction, and thickness as sheet waterproofing or 60-mil- (1.5-mm-) thick, uncured EPDM as required by manufacturer.

C. Exposed Sheet Flashing: 60-mil- (1.5-mm-) thick EPDM, cured or uncured, as required by manufacturer.

D. Bonding Adhesives: Adhesive for bonding polymeric sheets and sheet flashings to substrates and projections.

E. Splicing Cement and Cleaner: Single-component butyl splicing cement and solvent-based splice cleaner.

1. Butyl Gum Tape: 30-mil- (0.76-mm-) thick-by-6-1/4-inch- (160-mm-) wide, uncured butyl with polyethylene release film.

F. Lap Sealant: Single-component sealant.

G. In-Seam Sealant: Single-component sealant.

H. Water Cutoff Mastic: Butyl mastic sealant.

I. Waterproofing and Sheet Flashing Accessories: Provide sealants, pourable sealers, cone and vent flashings, inside and outside corner flashings, termination reglets, and other accessories recommended by waterproofing manufacturer for intended use.

J. Metal Termination Bars: Manufacturer's standard aluminum bars, approximately 1 inch (25 mm) wide, prepunched, with zinc-alloy-body fasteners and stainless-steel pins.

K. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/8 inch (3 mm), nominal.
2. Thickness: 1/8 inch (3 mm), nominal, for vertical applications; 1/4 inch (6 mm), nominal, elsewhere.
3. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

2.3 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

B. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a woven-geotextile facing with an apparent opening size not exceeding No. 40 (0.425-mm) sieve laminated to one side with a polymeric film bonded to the other side of a studded, non-biodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm per ft. (35 L/min. per m).

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

F. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.

3.2 FULLY ADHERED SHEET INSTALLATION

A. Install fully adhered sheets over entire area to receive waterproofing according to manufacturer's written instructions and recommendations in ASTM D 5843.

B. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required. Stagger end laps.

C. Apply bonding adhesive to substrates at required rate and allow to partially dry.

D. Apply bonding adhesive to sheets and firmly adhere sheets to substrates. Do not apply bonding adhesive to splice area of sheet.

E. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending beyond repaired areas in all directions.

F. Horizontal Application: Apply sheets with side laps shingled with slope of deck where possible.

1. Spread sealant bed over deck drain flange at deck drains and securely seal sheet waterproofing in place with clamping ring.

3.3 SEAM INSTALLATION

A. Cement Splice: Clean splice areas, apply splicing cement and in-seam sealant, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to produce a splice not less than 6 inches (150 mm) wide and to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet terminations.

B. Cement and Tape Splice: Clean splice areas, apply splicing cement and butyl gum tape, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet terminations.

3.4 SHEET FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to waterproofing manufacturer's written instructions.

B. Form wall flashings using exposed sheet flashing.

C. Extend deck sheet waterproofing to form wall flashings.

1. Flash penetrations and field-formed inside and outside corners with uncured sheet flashing.
2. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

D. Cover expansion joints and discontinuous deck-to-wall or deck-to-deck joints by extending deck sheet waterproofing over joints.

E. Terminate and seal top of sheet flashings with mechanically anchored termination bars.

3.5 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or mechanical fasteners that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install board insulation before installing drainage panels.

3.6 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071353

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SECTION 071413 - HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unreinforced hot fluid-applied waterproofing membrane.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.

C. Product test reports.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products; and who is eligible to receive waterproofing warranty specified.

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

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 deg F (minus 18 deg C).

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, in which manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that do not remain watertight for a period of ten (10) years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

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

1. American Hydrotech, Inc.; Monolithic Membrane 6125.
2. American Permaquik Inc.; Permaquik 6100.
3. Barrett Company; Ram-Tough 250.
4. Carlisle Corporation, Carlisle Coatings & Waterproofing Div.; CCW-500.
5. Miradri, T. C.; Miraseal 9100.
6. Monsey Bakor; Elasto-Seal 790-11.
7. Protecto Wrap Co.; HM625B.
8. Tremco; Tremproof 150.<

2.2 MATERIALS

A. Membrane: Single-component; 100 percent solids; hot fluid-applied, rubberized asphalt complying with CAN/CGSB-37.50.

B. Primer: ASTM D 41, asphaltic primer.

C. Elastomeric Flashing Sheet: 50-mil- (1.3-mm-) minimum, nonstaining, uncured sheet neoprene

D. Reinforcing Fabric: Manufacturer's recommended spun-bonded polyester fabric.

E. Protection Course: Semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between 2 asphalt-saturated fibrous liners and nominal thickness 1/8 inch (3 mm).

2.3 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel: Comply with Division 33 Section "Subdrainage."

B. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to 1 side and a polymeric film bonded to the other side of a 3-dimensional, nonbiodeg radable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

C. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a woven-geotextile facing with an apparent opening size not exceeding No. 40 (0.43-mm) sieve laminated to 1 side of a 3-dimensional, nonbiodeg radable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm per ft. (35 L/min. per m).

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean and prepare substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.2 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrate according to CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing," and waterproofing manufacturer's written instructions.

B. Install elastomeric sheet reinforcement and bond to deck and wall substrates where indicated or required. Extend elastomeric sheet reinforcement a minimum of 6 inches (150 mm) onto perpendicular surfaces and other work penetrating substrate.

C. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and sleeves.

1. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joint with sheet flashing extended along each side of joint and securely bond to substrate.
2. Install elastomeric flashing sheet at terminations and adhere to deck and wall substrates in a layer of hot, rubberized asphalt.

3.3 MEMBRANE APPLICATION

A. Apply rubberized asphalt according to CAN/CGSB-37.51 and manufacturer's written instructions.

B. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized-asphalt waterproofing.

C. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.

D. Unreinforced Membrane: Apply waterproofing to substrates and adjoining surfaces indicated. Spread hot fluid-applied, rubberized asphalt to provide a uniform, unreinforced, seamless membrane 180 mils (4.5 mm) thick.

E. Reinforced Membrane: Apply waterproofing to substrates and adjoining surfaces indicated. Spread hot fluid-applied, rubberized asphalt to a thickness of 90 mils (2.3 mm); embed reinforcing fabric, overlapping sheets 2 inches (50 mm); and spread another 125-mil- (3.2-mm-) thick layer to provide a uniform, reinforced, seamless membrane 215 mils (5.5 mm) thick.

F. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.

G. Install protection course with overlapped joints while rubberized asphalt is still hot.

3.4 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels to substrate according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.5 PROTECTING AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected horizontal membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction

END OF SECTION 071413

SECTION 071700 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes bentonite waterproofing and horizontal drainage systems between structural and topping slabs.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data, specifications and installation instructions for waterproofing, flashing systems, and other data as may be required to show compliance with the Contract Documents.

B. Shop Drawings: Submit shop drawings indicating the locations and extent of waterproofing. Include details, at a minimum of 3" = 1'-0" scale, for sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.

C. Waterproofing Manufacturer's Review of Waterproofing: Before purchasing and delivering waterproofing materials to the project site, submit written statement signed by the Contractor, the waterproofing installer and the manufacturer's technical representative, stating that the drawings and specifications for waterproofing work have been reviewed with a qualified technical representative of the selected manufacturer of the waterproofing assembly and that the manufacturer's technical representative has not indicated any further precautions or additional requirements to be fulfilled in connection with the use of the selected materials on this project.

D. Waterproofing Manufacturer's Final Inspection Report: Copy of waterproofing system manufacturer's inspection report of completed waterproofing membrane.

1.3 QUALITY ASSURANCE

A. System Performance Requirements: Install waterproofing systems that are watertight and which will not deteriorate or fail in any way within the warranty periods specified.

B. Installer Qualifications: Engage an experienced installer, who is authorized, approved, or licensed to install the specified waterproofing products, who has completed a minimum of three (3) waterproofing membrane applications over the last five (5) years which were similar in material, design, and extent to that indicated for the Project – as determined by the Architect – and which have resulted in construction with a record of successful in service performance. Provide project names, locations, completion dates, names and telephone numbers of each project's architect and owner.

1. Employ only skilled tradesmen who are thoroughly experienced with the materials and equipment to be used for the work. The installer shall maintain a full time supervisor/foreman who is on the job site during the time that the waterproofing work is in progress and who is experienced in installing waterproofing systems similar to type and scope required for this project.

C. Manufacturer Qualifications: The manufacturer shall provide evidence indicating the specified materials have been manufactured by the same source and successfully utilized on a yearly basis for a minimum of 10 years on projects of a similar scope to that shown and specified for this project.

D. Single-Source Responsibility: Obtain bentonite waterproofing materials from a single manufacturer. Obtain accessory products used in conjunction with bentonite waterproofing from sources acceptable to bentonite waterproofing manufacturer.

E. Manufacturers Inspection: The Contractor shall arrange and pay for the manufacturer of the bentonite waterproofing to inspect, test, and report on all work pertaining thereto. The Contractor shall arrange for the manufacturer's technical representative to perform the above duties at the start-up, and thereafter weekly, until the completion of the waterproofing work. The Contractor shall be responsible for carrying out all recommendations of the manufacturers technical representative to ensure a total and complete installation of the waterproofing work. The issuance of the manufacturers final inspection report shall be made prior to the acceptance of the work by the Architect.

F. Preinstallation Waterproofing Conference: As soon as possible after the award of the waterproofing work, but no later than 2 weeks before the installation of the waterproofing work, conduct a waterproofing conference to comply with requirements in Division 1 Section "Project Management and Coordination" and the following. The meeting shall include the waterproofing installer, Architect, Owner, installers of substrate construction such as decks and other work adjoining waterproofing systems including penetrating work, and representatives of any other entities directly concerned with waterproofing system performance.

1. Review foreseeable methods and procedures related to waterproofing substrates, including but not limited to, the following:

   a. Tour representative areas of substrates to be waterproofed, inspect and discuss condition of substrate, slope, membrane application, flashing details, drains, curbs, penetrations, and other prepatory work.
   b. Review waterproofing system requirements including drawings and specifications and other contract documents.
   c. Review required submittals, both complete and incomplete.
   d. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
   e. Discuss waterproofing system protection requirements for construction period extending beyond waterproofing installation.

2. Record discussions and furnish copy of recorded discussions to each attendee.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers, labeled with manufacturer's name, product name, date of manufacture, and directions for storing and use.

B. Store materials in a clean, dry, location protected from precipitation and direct sunlight and within the temperature range required by the waterproofing manufacturer.

1. Remove and replace bentonite materials that have been prematurely exposed to moisture.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Do not apply waterproofing materials to surfaces where ice or frost is visible. Bentonite clay products in panel or membrane form may be placed on damp surfaces. Do not apply bentonite waterproofing materials in areas with standing water.

B. Comply with manufacturer's written instructions regarding weather conditions before and during waterproofing installation, condition of the substrate to receive waterproofing, and protection of the installed waterproofing system.

1. Protect all bentonite waterproofing systems after installation by covering with backfill materials (for vertical applications) within 72 hours after the placement of bentonite waterproofing system.

1.6 WARRANTY

A. Special Manufacturer's Watertightness Warranty: Written labor and material warranty, signed by waterproofing manufacturer agreeing to repair or replace waterproofing systems that do not remain watertight or which deteriorate or fail in any way within specified warranty period.

1. Warranty Period: Five (5) years after date of Substantial Completion.

B. Special Installer's Warranty: Submit waterproofing Installer's warranty agreeing to repair or replace defective waterproofing work (materials and workmanship) which have failed to provide a watertight system signed by the Contractor and Installer for the following warranty period. The warranty shall commence on the day the waterproofing has been accepted by the Architect in writing. Upon notification of such defective work, and within the warranty period, make the necessary repairs and replacements at the convenience of the Owner.

1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Granular Bentonite: Granular Wyoming sodium bentonite clay containing a minimum of 90 percent montmorillonite (hydrated aluminum silicate) and a 10% maximum unaltered volcanic ash and other native sediments, with a minimum of 90 percent passing a 20-mesh (850-micrometer) sieve. The bentonite shall have a minimum water absorption of 900% by weight when tested in accordance with ASTM E946.

B. Woven Geotextile: Fabric of silt film polypropylene having a thickness of 0.44 mm when tested in accordance with ASTM D1777, a mass area of 3.2 oz./sq. yd. (105 g/sq. m) when tested in accordance with ASTM D5261, and a grab tensile strength of 109 lbs. (480 N) when tested in accordance with ASTM D4632.

C. Non-Woven Geotextile: Fabric of needlepunched, polypropylene having a thickness of 2.0 mm when tested in accordance with ASTM D1777, a mass area of 6.0 oz./sq. yd. (200 g/sq. m) when tested in accordance with ASTM D5261, and a grab tensile strength of 6 lbs. (27 N) when tested in accordance with ASTM D4632.

D. Pourable Granular Bentonite: Pure granular Wyoming bentonite clay (sodium bentonite) for sealing around penetrations.

E. Bentonite Mastic: Trowelable consistency, bentonite compound, specifically formulated for application at joints and penetrations.

1. Volclay Bentoseal; CETCO.

F. Preformed Waterstop: Flexible strip of bentonite/butyl rubber based waterproofing compound in coil form, designed specifically for vertical and horizontal joints in concrete construction nominal 1 x 3/4-inch (25 x 19 mm) extruded rectangular shape.

1. Volclay Waterstop-RX 101; CETCO.

2.2 GEOTEXTILE/BENTONITE SHEETS

A. Geotextile Waterproofing: Composite of high strength woven and non-woven polypropylene geotextile fabrics and high swelling bentonite, interlocked by needle punching, and having a dry thickness of 1/4 inch (6.4 mm-) when measured in accordance with ASTM D1777, a clay mass area of not less than 1.1 lb/sq. ft. (4.8 kg/sq. m) when tested in accordance with ASTM D3776 modified, and a puncture resistance of not less than 100 lbs. (445 N) when tested in accordance with ASTM D4833. The hydrostatic pressure resistance of each sheet shall not be less than 231 ft. (70 m) when tested in accordance with ASTM D5385. The permeability of each sheet shall not be less than 1×10^{-9} cm/sec. when tested in accordance with ASTM D5084.

1. Volclay Voltex; CETCO.

2.3 INSTALLATION ACCESSORIES

A. Termination Bar: Extruded- or formed-aluminum bars, prepunched or drilled 12 inch- (300-mm-) o.c. to receive fasteners, with upper flange formed to receive bentonite mastic.

B. Fasteners: Case-hardened nails or hardened-steel, powder-actuated fasteners. Provide 1/2- or 1-inch- (13- or 25-mm-) diameter washers under fastener heads.

C. Waterstop Adhesive: Water-based adhesive used to secure waterstop to vertical and horizontal surfaces.

D. Non-Shrink Cementitious Grout: Type compatible with bentonite panel and bentonite mastic as recommended by the bentonite waterproofing manufacturer.

E. Drainage Board: A two part 7/16" thick, prefabricated drainage board specifically designed for horizontal split slab construction exposed to light vehicular traffic and consisting of a formed dimpled polystyrene core covered on one side with a factory adhered woven polypropylene geotextile filter fabric with sufficient selvage to overlap adjacent drainage boards. Physical properties of the fabric to include a weight of 6.6 oz./s.y. (ASTM D3776), grab tensile strength of 370 lbs. (ASTM D4632), a puncture strength of 135 lbs. (ASTM D3787), Apparent opening size 70 US standard Sieve (ASTM D4751), permeability of 0.011 cm/sec. (ASTM D4491), flow rate 110 gpm/s.f. (ASTM D4491). Physical properties of the board to include a flow capacity of 18 gpm/ft of width (ASTM D4716) and a compressive strength of 21,000 lbs./s.f. (ASTM D1621).

1. Aquadrain 20H Subsurface Drain Composite; CETCO.

F. Filter Fabric: Matching the properties of the drainage board filter fabric.

G. Tape: High density polyethylene types with pressure sensitive adhesive of type recommended by the drainage board manufacturer for pipe penetrations, minimum 4-inches (100-mm) wide.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations affecting performance of bentonite waterproofing. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that substrate is complete and that all work that will penetrate waterproofing is complete and rigidly installed. Verify locations of waterproofing termination.

3.2 PREPARATION

A. Coordinate work in the vicinity of waterproofing to ensure proper conditions for installing the waterproofing system and to prevent damage to the waterproofing after installation.

3.3 INSTALLATION, GENERAL

A. Install waterproofing and accessories according to manufacturer's written instructions, standard details, and recommended practices. Consult with manufacturer where any special conditions not otherwise covered in printed instructions occur.

1. Apply bentonite mastic, at changes of plane, construction joints in substrate, projections, and penetrations.

B. Waterstop Application: Place waterstops after installation of reinforcing bars, but prior to placing of interior forms and pouring of concrete. Place waterstop strips on concrete footings, and foundation wall keyways, adjacent to the exterior side of the outermost reinforcing bars. If concrete cover will be less than 3 inches (75 mm), place strips adjacent to the interior side of the outermost reinforcing bars.

1. Horizontal Surfaces: Secure strips with adhesive supplemented by nailing with 2 inch (50 mm) concrete cut nails spaced not more than 24 inches (600 mm) o.c.
2. Vertical Surfaces: Secure strips with adhesive supplemented by nailing with 2 inch (50 mm) concrete cut nails spaced not more than 24 inches (600 mm) o.c.
3. Cold Joints in Slab: Against the previously poured slab edges, and prior to pouring concrete slab, install 1 line of waterstop strips. Nail watestops to substrates as recommended by the manufacturer.
4. Sleeved Pipe and Conduit Penetrations: Install waterstop strip around outer diameter of the sleeve. Install a second waterstop strip between the sleeve's inner diameter and the pipe or conduit, contacting both surfaces continuously. Completely fill the void area between the sleeve and pipe, or conduit, with non-shrink grout.
5. Unsleeved Pipe and Conduit Penetrations: Install waterstop strip around outer diameter of the pipe or conduit.

C. Protect waterproofing from damage and wetting before and during subsequent construction operations. Repair punctures, tears, and cuts according to manufacturer's written instructions.

3.4 GEOTEXTILE/BENTONITE SHEET INSTALLATION

A. Permanent Sheeting, Lagging, and Underpinning:

1. Gaps between the wood lagging shall be no wider than 1". If gaps between lagging are in excess of 1" the gaps shall be filled with non-shrink grout. If water is flowing through the lagging, 6 mil thick polyethylene sheeting shall be installed with nails over the area before the geotextile/bentonite sheets are attached. In areas where gaps of greater than 3" exist between lagging install drain board wide enough to span the gap to provide a uniform rigid surface to attach the geotextile/bentonite sheets. Nail drain board to lagging.
2. Cut and attach a strip of geotextile/bentonite sheet centered over all soldier piles. Geotextile/bentonite sheet shall extend a minimum of 4 inches (100 mm) onto the lagging on both sides of soldier piles.
3. Attach geotextile/bentonite sheets to lagging horizontally, with dark gray geotextile outward facing installer, using washer head mechanical fasteners spaced 24 inches (600 mm) o.c. around the edge of each sheet. Overlap edges and ends a minimum of 4 inches (100 mm). Stagger all vertical overlaps a minimum of 24 inches (600 mm).

    a. The starter sheet at the base of the property line wall shall be fastened such that the top edge of the horizontal sheet is 18" above the top elevation of the mat slab to be placed immediately adjacent to it.

4. Waterproof tiebacks and penetrations according to waterproofing manufacturer's written instructions. Detail around all penetrations, tieback rods, nuts, and plates with 3/4 inch (19 mm) cant of bentonite mastic. Extend 1/4 inch (6 mm) bentonite mastic over substrate a minimum radius of 6 inches (150 mm) around penetrations and tiebacks. Cut bentonite sheets to fit snugly around penetrations and tiebacks.
5. Terminate at grade with metal termination bar fastened 12 inches (300 mm) o.c. Cover top edge of geotextile/bentonite sheets with 1/2 inch (13 mm) thick, 2 inches (50 mm) wide layer of bentonite mastic.

B. Horizontal Drainage Board and Filter Fabric Installation over Mat Slab Foundation:

1. Install, protect, and repair filter fabric sheets according to the manufacturers recommendations; place sheets in position with longest dimension parallel with direction of flow. Lap joints 6 inches (150 mm). At pipe penetrations, cut a hole in the filter fabric corresponding to the size and location of the pipe.

2. Starting from the low point to the high point across the filter fabric covered mat slab surface, place drainage board with the plastic core side down against the filter fabric covered mat slab and the filter fabric side of the drainage board panel up. Place sufficient ballast on top of the drainage board panel to hold it in place until topping slab is placed.

3. Connect adjacent cores edges by pulling filter fabric back to expose two rows of core dimples and interlocking the core dimples with the installed panel. With the next course, the flangeless panel edge shall be placed over the top flange edge of the panel below and butted dimple to dimple. All connections shall be completed in shingle fashion so the water will flow with the overlap and not against it. Overlap fabric in the direction of water flow.

4. Wrap all drainage board terminations with the filter fabric flap by tucking it behind the core and securing it. At pipe penetrations, cut a hole in the core corresponding to the size and location of the pipe. Then cut an "X" in the fabric. Tape the fabric flaps around the pipe, and tape the lengths of the cuts in the fabric, to seal the fabric against the pipe and prevent debris from passing through the cuts in the fabric. Prevent dirt, concrete, and other construction debris from entering the drainage panel core.

END OF SECTION 071700

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SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes building insulation.

1.2 SUBMITTALS

A. Product Data: Submit product data for each product indicated.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by 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 plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards and, for preformed units, in sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square edged; of type, density, and compressive strength indicated below:

1. Type IV, 1.6-lb/cu. ft. (26-kg/cu. m) minimum density and 25-psi (173-kPa) minimum compressive strength.

    a. Styrofoam Square Edge; Dow Chemical Co.
    b. Formular 250; Owens-Corning.

C. Foil-Faced, Flexible Glass-Fiber Batt Insulation: Complying with ASTM C 665, Type III; faced on one side with foil-scrim-kraft vapor retarder; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:

1. Nominal density of not less than 1.5 lb/cu. ft. (24 kg/cu. m) nor more than 1.7 lb/cu. ft. (26 kg/cu. m), thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).

2.2 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

B. Vapor Retarder Tape: Minimum 5 mil tri-directional, reinforced, dead soft, aluminum foil faced tape with minimum 2 mil rubber or acrylic based adhesive, flame spread rated class A (25 or Less) per ASTM E84 and Classified to UL STD 723 General Use Tape.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

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

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders.

3.3 INSTALLATION, GENERAL

A. General: Install insulation to comply with insulation manufacturer's written instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturers technical representative for specific recommendations before proceeding with installation of insulation.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set 2" thick extruded polystyrene boards in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not indicated, extend insulation to the full depth of the frost line below exterior grade level. Frost line depth shall be dictated by the applicable County or municipal codes, regulations and ordinances having jurisdiction, whichever is more stringent.

B. Slab on Grade Insulation: Apply a single layer of 2" thick extruded polystyrene board insulation in a 48" wide band under the slab on grade as indicated around the entire perimeter of the building.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions.

B. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces.

1. Maintain integrity of insulation with vapor retarders by taping joints, ruptures and edges of units adjoining other surfaces. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders by taping to create an airtight seal between penetrating objects and vapor barrier. Repair any tears or punctures in vapor retarders immediately before concealment by other work using tape.

C. Install glass fiber blankets in cavities formed by framing members according to the following requirements:

1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. For metal-framed wall cavities support faced blankets by taping stapling flanges to flanges of metal studs.
4. For wood-framed construction, install glass-fiber blankets by lapping blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to

abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 074113 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Factory-formed and field-assembled, standing-seam metal roof panels.
2. Metal soffit panels.

1.2 PERFORMANCE REQUIREMENTS

A. Wind-Uplift Resistance: Comply with UL 580 for wind-uplift resistance class indicated.

B. Structural Performance: Capable of withstanding the effects of gravity loads and the following loads and stresses, based on testing according to ASTM E 330:

C. Seismic Performance: Provide metal roof panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

D. Thermal Movements: Provide metal roof panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of metal roof panel and accessory indicated.

B. Coordination Drawings: Drawn to scale and coordinating metal roof panel installation with penetrations and roof-mounted items.

C. Samples: For each exposed finish.

D. Qualification Data: For Installer and professional engineer.

E. Material certificates.

F. Product test reports.

G. Maintenance data.

H. Warranties: Special warranties specified in this Section.

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1.4 QUALITY ASSURANCE

A. Installer Qualifications: Workers trained and approved by manufacturer.

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

1.5 WARRANTY

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

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

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

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

1. Siliconized Polyester Finish Warranty Period: 10 years from date of Substantial Completion.
2. Fluoropolymer Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PANEL MATERIALS

A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
3. Surface: Smooth, flat finish.
4. Exposed Finishes:

a. Siliconized-Polyester Coating: Dry film thickness of not less than 0.2 mil (0.005 mm) for epoxy primer and 0.8 mil (0.02 mm) for topcoat.

1) Color: As selected from manufacturer's full range.

b. High-Performance Organic Finish: Three-coat, thermocured system with fluoropolymer coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2605, except as modified below:

1) Color: TBD, coordinate with architect.

5. Concealed Finish: White or light-colored acrylic or polyester backer finish.

B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal roof panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.3 THERMAL INSULATION FOR METAL ROOF PANELS

A. Refer to Division 07 Section "Thermal Insulation."

2.4 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.

B. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felts, low in sulfur content.

C. Slip Sheet: Building paper, minimum 5 lb/100 sq. ft. (0.24 kg/sq. m), rosin sized.

2.5 SUBSTRATE BOARDS

A. Gypsum Board: Type X, 5/8 inch (16 mm), ASTM C 442 or ASTM C 36.

B. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M; Type X, 5/8-inch (16-mm) thick.

C. Substrate-Board Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FMG 4470, designed for fastening substrate board to substrate.

2.6 MISCELLANEOUS METAL FRAMING

A. General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with manufacturer's standard corrosion-resistant zinc coating.

2.7 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating.

1. Fasteners for Roof Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal roof panels.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

B. 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.

2.8 METAL ROOF PANELS

A. Standing-Seam Metal Roof Panels: Factory-formed, designed to be field assembled by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Comply with ASTM E 1514.
2. Manufacturers:

    a. AEP-Span.
    b. Berridge Manufacturing Company.
    c. CENTRIA Architectural Systems.
    d. Perma-Clad Products.
    e. Petersen Aluminum Corporation.

3. Type: Vertical rib, seamed joint as indicated on Drawings.

4. Material: Metallic-coated steel sheet, 0.0209 inch (0.55 mm) thick.

    a. Exterior Finish: Fluoropolymer.
    b. Color: As selected by Architect from manufacturer's full range.

5. Clips: Floating to accommodate thermal movement.

    a. Material: stainless-steel sheet.

6. Joint Type: As standard with manufacturer.
7. Panel Coverage: 24 -inches
8. Panel Height: 1-inch.
9. Uplift Rating: UL 90.

2.9 ACCESSORIES

A. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
2. Clips: Minimum 0.0625-inch- (1.6-mm-) thick, stainless-steel panel clips designed to withstand negative-load requirements.

3. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch- (0.64-mm-) thick, stainless-steel or nylon-coated aluminum sheet.
4. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Formed from 0.0179-inch- (0.45-mm-) thick, metallic-coated steel sheet. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

C. Gutters: Formed from 0.0179-inch- (0.45-mm-) thick, metallic-coated steel sheet. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced 36 inches (900 mm) o.c., fabricated from same metal as gutters. Provide bronze, copper, or aluminum wire ball strainers at outlets. Finish gutters to match exiting gutters.

D. Downspouts: Formed from 0.0179-inch- (0.45-mm-) thick, metallic-coated steel sheet; in 10-foot- (3-m-) long sections, complete with formed elbows and offsets. Finish downspouts to match exiting gutters and downspouts.

E. Roof Curbs: Fabricated from 0.0478-inch- (1.2-mm-) thick, metallic-coated steel sheet; with welded top box and bottom skirt, and integral full-length cricket. Fabricate curb subframing of minimum 0.0598-inch- (1.5-mm-) thick, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads, of size and height indicated. Finish roof curbs to match metal roof panels. Insulate roof curb with 1-inch- (25-mm-) thick, rigid insulation.

2.10 FABRICATION

A. General: Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Where indicated, fabricate metal roof panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

E. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 PREPARATION

A. Substrate Board: Install substrate boards over roof sheathing on entire roof surface. Attach with substrate-board fasteners.

1. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
2. Comply with UL requirements for fire-rated construction.

B. Install flashings and other sheet metal to comply with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim."

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment and building-paper slip sheet on roof sheathing under metal roof panels. Use adhesive for temporary anchorage. Apply at locations indicated on Drawings, in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

B. Apply slip sheet over underlayment before installing metal roof panels.

3.3 METAL ROOF PANEL INSTALLATION, GENERAL

A. General: Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal roof panels by torch is not permitted.
2. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels.
3. Provide metal closures at peaks rake edges rake walls and each side of ridge and hip caps.
4. Flash and seal metal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
5. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
6. Lap metal flashing over metal roof panels to allow moisture to run over and off the material.

B. Fasteners:

1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.
2. Aluminum Roof Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

1. Coat back side of aluminum roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies.

1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.4 FIELD-ASSEMBLED METAL ROOF PANEL INSTALLATION

A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
3. Provide elbows at base of downspouts to direct water away from building.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113

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SECTION 07531 - EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes adhered membrane roofing system.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

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

C. Samples: For each product included in membrane roofing system.

D. Research/evaluation reports.

E. Maintenance data.

1.3 QUALITY ASSURANCE

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

B. Source Limitations: Obtain components for membrane roofing system from same manufacturer as roofing membrane.

C. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.

D. Pre-installation Conference: Conduct conference at project site.

1.4 PROJECT CONDITIONS

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

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

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

PART 2 - PRODUCTS

2.1 EPDM ROOFING MEMBRANE

A. EPDM Roofing Membrane: ASTM D 4637, Type I, nonreinforced uniform, flexible sheet made from EPDM, and as follows:

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 manufacturers specified.

a. Carlisle SynTec Incorporated..
b. Firestone Building Products Company..
c. Johns Manville International, Inc.
d. Versico Inc.

2. Thickness: 60 mils (1.5 mm), nominal.
3. Exposed Face Color: White.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

B. Sheet Flashing: 60-mil- (1.5-mm-) thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Seaming Material: Manufacturer's standard synthetic-rubber polymer primer and 3-inch- (75-mm-) wide minimum, butyl splice tape with release film.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

F. Miscellaneous Accessories: Provide lap sealant, water cutoff mastic, metal termination bars, metal battens, pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.3 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1 aluminum oil facer on both major surfaces.

B. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

A. .Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

B. Cover Board: ASTM C 208, Type II, Grade 2, cellulosic-fiber insulation board, 1/2 inch (13 mm) thick.

C. Roofing Asphalt: ASTM D 312, Type III or IV.

1. Asphalt Primer: ASTM D 41.

2.5 WALKWAYS

A. Walkway Roof Pavers: Heavyweight, hydraulically pressed, concrete units, **square edged**, factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:

1. Size: 24 by 24 inches (600 by 600 mm). Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch (1.6 mm) in length, height, and thickness.
2. Weight: 18 lb/sq. ft. (90 kg/sq. m).
3. Compressive Strength: **7500 psi (52 MPa)** minimum.

PART 3 - EXECUTION

3.1 SUBSTRATE BOARD

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

3.2 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 1 inch (25 mm) or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

E. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry.
2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
3. Set each layer of insulation in a cold fluid-applied adhesive.

F. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck.

1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof based on an FM Class I-60 roof deck resistance.

3.3 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to splice area of roofing membrane.

D. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

E. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

F. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.4 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.5 FIELD QUALITY CONTROL

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

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

END OF SECTION 075323

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SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sheet metal flashing and trim.

1. Single Subcontract Responsibility: Refer to Sections 071413 "Hot Fluid Applied Waterproofing", 074113 "Metal Roof Panels" and 077101 "Green Roof" for the requirements of single subcontract responsibilities for sheet metal flashing and trim.

1.2 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:

1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft. (1.48 to 2.15 kPa): 90-lbf/sq. ft. (4.31-kPa) perimeter uplift force, 120-lbf/sq. ft. (5.74-kPa) corner uplift force, and 45-lbf/sq. ft. (2.15-kPa) outward force.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from surface temperatures ranging from -5°F. to +180°F. (+10 to +82 deg C), without buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements.

1. Dimensions shown on Drawings are based on an assumed design temperature of +70°F (+21 deg C). Fabrication and installation procedures shall take into account the ambient temperature range at the time of the respective operations.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.3 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Submit shop drawings showing layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of expansion-joint covers, including showing direction of expansion and contraction.

C. Samples: Submit 8" x 8" (200 x 200 mm) square samples of sheet metal flashing, in the specified finish.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Subcontract the sheet metal flashing and trim work to a firm which is specialized in the fabrication and installation of sheet metal flashing and trim and who has successfully installed work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 5 years.

B. Sheet Metal Flashing and Trim Reference Standards: Comply with the industry standard sources below. Where sheet metal flashing and trim work details have not been specifically detailed on the drawings or specified the Contractor shall submit, for the Architect's approval, proposed sheet metal detailing. The primary source for proposed sheet metal detailing shall come from the industry standard sources below.

1. SMACNA's "Architectural Sheet Metal Manual."

2. NRCA's "Roofing and Waterproofing Manual."

C. Design Modifications: Submit design modifications necessary to meet the performance requirements and field coordination. Variations in details or materials which do not adversely affect the appearance, durability or strength of components shall be submitted to the Architect for review. Maintain the general design concept without altering size of members, profiles and alignment.

1.5 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.6 WARRANTY

A. Furnish written warranty against water leakage resulting from defects of materials or workmanship. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements at the convenience of, and no cost to, the Owner. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

1. Warranty period shall be 5 years after the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, soft annealed, Type 304, with No. 2D finish, except where harder temper is required for forming or performance.

2.2 UNDERLAYMENT MATERIALS

A. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

B. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m), complying with FS UU-B-790A.

C. Self-Adhering, High-Temperature Sheet: 0.76 mm thick, self adhering, self sealing, underlayment consisting of slip-resisting high density cross laminated polyethylene-film top surface laminated to layer of butyl rubber based adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 116 deg C; ASTM D 1970.
2. Product Reference: Grace, W. R. & Co.; Vycor Ultra.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, same metal as flashing/sheet metal, annular threaded nails, self-tapping screws, and other suitable fasteners designed to withstand design loads.

C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer, use a noncorrosive rosin flux over tinned surfaces.

D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

G. 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.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

I. Wood Nailer Strips: Provide wood nailer strips, fabricated to sizes indicated, from lumber complying with the requirements of Section 06105, MISCELLANEOUS CARPENTRY, and fire retardant treated by pressure process using chemical solution which is non-hygroscopic and non-corrosive to sheet metal used.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.

1. Material: Stainless steel, 0.0187 inch (0.5 mm) thick.

2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

5. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with the referenced standards that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored. Cleats shall be 2 inches (50 mm) wide by nominal 3 inches (75 mm) long typically, minimum 0.0187 inch (0.5 mm) thick, punch for minimum 2 nail or screw holes. One end shall be locked into seams, or into folded edge of sheet metal sheets, the other end shall be secured with nails or screws and folded back over nail or screw heads.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Parapet Scuppers: Fabricate scuppers of dimensions shown, or if not shown not less than 6" x 6" cross sectional throat dimensions, with scupper throat on exterior side having an exposed 1" wide hemmed flange with the junction between the flange and the exterior face of the precast concrete parapet sealed, 4-inch- (100-mm-) wide wall flanges to interior soldered to the scupper before the scupper's insertion through the precast parapet with the junction between the closure flange and the interior face of the precast concrete parapet sealed, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof, unless otherwise detailed. Solder notched or perforated gravel stop angles to base of scupper to prevent roof ballast from migrating through scupper throat.

1. Fabricate parapet scuppers from the following material:

   a. Stainless Steel: 0.0187 inch (0.5 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners and solder watertight.

1. Joint Style: Butt, with 6-inch- (150-mm-) wide exposed cover plates.
2. Fabricate copings from the following material:

   a. Stainless Steel: 0.0250 inch (0.65 mm) thick.

B. Counterflashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

C. Flashing Receivers: Fabricate from the following material:

1. Stainless Steel: 0.0156 inch (0.4 mm) thick.

D. Roof-Penetration Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim work.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet.
2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, and butyl sealant.

E. 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.

1. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

G. Fasteners: Use stainless-steel fasteners of sizes that will penetrate substrate not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

H. Seal joints with butyl sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant.

I. Soldered Joints: Edges of sheets to be soldered shall be in close contact at every point along the joint before soldering. Edges of all sheets of sheet metal to be soldered shall be tinned with solder on both sides for a minimum width of 1-1/2 inches (38 mm). Where specified, all seams shall be thoroughly soldered to produce watertight joints. All soldering shall be done slowly with well heated metal - to heat sheet thoroughly and to sweat solder completely through full width of seam. Ample solder shall be used and seam shall show at least one full inch of evenly flowed solder. Wherever possible all soldering shall be done in flat position. Remove every trace of flux residue from metal promptly after tinning. Comply with manufacturer's recommended

methods for cleaning and neutralization. Clean exposed surfaces of sheet metal flashing and trim of every substance which is visible or might cause corrosion of metal surfaces. Use soldering irons (3 lb. Minimum each). Do not use abrasives in preparing the sheet metal surfaces for soldering. All exposed parts of finished soldered joints shall be smooth and free of smeared solder.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to the referenced standards and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior and exterior wall faces, over cants or tapered edge strips, and under roofing membrane.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and the referenced standards. Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch (400-mm) centers.
2. Anchor interior leg of coping with screw fasteners and washers at 18-inch (450-mm) centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap seam counterflashing joints a minimum of 4 inches (100 mm).

1. Secure in a waterproof manner by means of anchor and washer at 36-inch (900-mm) centers.

2. Fill the reglet with elastomeric sealant.

3. Form a slight bend in the counterflashing to cause a spring action pressure of the lower edge of the sheet to be applied onto the base flashing.

3.5 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Seal flashing with elastomeric sealant to equipment support member.

3.6 CLEANING AND PROTECTION

A. Clean and neutralize flux materials. Clean off excess solder and sealants.

B. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, and pieces of flashing. Maintain in a clean condition during construction.

C. 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

SECTION 077101 – GREEN ROOF

PART I GENERAL

1.01 Summary

A. This specification serves as a guideline and shall be adapted to suit the needs of each individual project by the architect. It is prepared in accordance with the CSI three-part section format and shall be included as a separate section under **DIVISION 7 - Thermal and Moisture Protection**. Improvements and other changes to the contents shall be made only with the written approval of the architect.

1.02 RELATED SECTIONS

A. DIVISION 3 - Concrete [Section 03300] - Roof Deck Surface/Substrate
The coordination of this section is necessary to facilitate the successful installation of the waterproofing membrane.

Cast in Place Concrete/Composite Deck

A. Strength/density: minimum 2,500 psi (17,235 kPa) compressive strength
minimum 115 pcf (1842 kg/m^3) density

B. Finish: Wood-float or wood-troweled equivalent finish. Steel troweled is not desirable.

C. Concrete Hydration (Cure):

1. Method of Cure: Water cure, wet coverings, paper sheets, plastic sheets or approved liquid curing compound (sodium silicate preferred).
2. Duration of Cure/Dry:
   a. Structural Weight Concrete: recommend 28 days, minimum 14 days, prior to application of the membrane.
   b. Lightweight Structural Concrete: recommend 60 days, minimum 28 days, prior to application of membrane. Venting of the deck from the underside is recommended to facilitate drying.
   c. The above minimum cure/dry times are recommended based upon basic concrete fundamentals and experience. Depending on conditions (i.e., ambient temperature, humidity) the concrete may be dry enough to receive application of the membrane in less than the 14 day minimum recommendation.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM).
B. Canadian General Standards Board, CGSB-37.50-M89, Standard for Asphalt, Rubberized, Hot Applied, for Roofing and Waterproofing.
C. Underwriters Laboratories (UL) Class A.
D. Dow Chemical Company, TechNote 508 Ballast Design Guide for IRMA Roofs.

1.04 DEFINITIONS

A. Green Roof -- An area of planting/landscaping, built up on a waterproofed substrate at any level that is separated from the natural ground by a man-made structure.

B. Extensive Green Roof -- Low to no maintenance landscaping consisting of shallow soil depths (< 6 inches (152mm) with plant varieties restricted to primarily mosses, herbs and succulents capable of withstanding harsh growing conditions.

C. Intensive Green Roof -- Landscaping requiring regular maintenance, consisting of deeper soil depths (> 8 inches (203mm) with a wider variety of plant species possible including shrubs and small trees.

D. Shallow-Intensive/Lawn Green Roof — Landscaping requiring more regular maintenance than an extensive condition but limited in plant selection due to shallower soil depths, (i.e., sod grass lawn).

E. Garden Roof® -- Patented system of drainage, water retention and root barrier components utilized in the construction of green roofs over Hydrotech's MM 6125EV® roofing membrane.

F. Steep Slope Green Roof -- Defined as a slope exceeding 3:12 pitch.

1.05 SYSTEM DESCRIPTION

A. Furnish and install a completed Extensive Garden Roof® Assembly including concrete surface conditioner, Monolithic Membrane 6125EV®-FR and flashings, protection course, root barrier protection, STYROFOAM® brand insulation (if required), water retention mat (if required), drainage/water retention component, filter fabric, lightweight engineered growing medium (soil) and vegetation.

1.06 SUBMITTALS

A. Certification from an approved independent testing laboratory experienced in testing rubberized asphalt material, that the material meets the CGSB-37.50-M89 standard for rubberized asphalt membranes, including applicable ASTM procedures.

B. Certification showing full time quality control of production facilities responsible for the manufacture of the rubberized asphalt and that each batch of material is tested to insure conformance with the manufacturers published physical properties.

B. Certification showing that all components of the green roof assembly are being supplied and warranted by a single-source manufacturer.

D. Evidence that the roof membrane assembly is currently Class A listed with Underwriters Laboratories.

E. Evidence that the extruded polystyrene insulation if used is free from CFC's.

F. The plant manufacturing the rubberized asphalt material shall have ISO 9001-2000 approval as evidenced by a notarized copy of the official certificate.

G. Provide product data on all components of the green roof assembly.

1.07 QUALITY ASSURANCE

A. The Roofing/Waterproofing Contractor shall demonstrate qualifications to perform the work of this Section by submitting the following documentation:

1. Certification or license by the membrane manufacturer as a locally based, authorized applicator of the product the installer intends to use, for a minimum of five (5) years.

2. List of at least three (3) projects, satisfactorily completed within the past five (5) years, of similar scope and complexity to this project. Previous experience submittal shall correspond to specific membrane system proposed for use by applicator.

C. Refer to Section 1.04 SYSTEM DESCRIPTION. Include single-source for all components from the manufacturer.

D. The rubberized asphalt membrane product shall contain an inert clay filler and crumb rubber to enable the product to be resistant to acids (fertilizers, building washes and acid rain) and maintain membrane thickness during application.

E. Membrane Manufacturer shall have available an in-house technical staff to assist the contractor, when necessary, in application of the products and final inspection of the assembly.

F. Membrane Manufacturer Qualifications: Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:

1. Membrane Manufacturer shall show evidence that the specified rubberized asphalt has been manufactured by the same source for fifteen (15) years and successfully installed on a yearly basis for a minimum of fifteen (15) years on projects of similar scope and complexity.

2. Membrane Manufacturer shall not issue warranties for terms longer than they have been manufacturing their hot fluid rubberized asphalt membrane.

G. Pre-Construction Conferences. The manufacturer will meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the roofing assembly.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original unopened containers of packaging clearly labeled with manufacturer's name, brand name, instruction for use, all identifying numbers, and U.L. labels.

B. Materials shall be stored in a neat, safe manner, not to exceed the allowable structural capacity of the storage area.

C. Store materials in a clean, dry area protected from water and direct sunlight.

D. Store all adhesives at temperatures between 60°F (15.5°C) and 80°F (26.6°C). If exposed to lower temperatures, restore materials to 60°F (15.5°C) minimum temperature before using.

1.09 PROJECT CONDITIONS

A. Application of the membrane shall not commence nor proceed during inclement weather. All surfaces to receive the membrane shall be free of water, dew, frost, snow and ice.

B. Application of membrane shall not commence nor proceed when the ambient temperature is below 0°F (-17.7°C).

C. Preparation and application of membrane shall be conducted in well ventilated areas.

D. Over its service life, do not expose membrane or accessories to a constant temperature in excess of 180°F (82°C) (i.e., hot pipes and vents or direct steam venting, etc.).

E. Adhesives contain petroleum distillates and are extremely flammable. Do not breathe vapors or use near an open fire. Do not use in confined areas without adequate ventilation. Consult container or packaging labels and Material Safety Data Sheets (MSDS) for specific safety information.

F. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat, etc.) to come in contact with the roof membrane. Any exposure to foreign materials or chemical discharges shall be presented to membrane manufacturer for evaluation to determine any impact on the roof membrane assembly performance.

G. Concrete Deck Surface Condition. IMPORTANT - Refer to 1.02 Related Sections.

H. Deck Preparation; refer to Section 3.02 Preparation.

I. Deck slopes greater than 3 inches in 12 inches (approx. 15 degrees or 25%) shall be limited to extensive and shallow-intensive applications and require special installation considerations.

J. Ballasting requirements vary depending on height of roof deck, parapet height, and design wind speed based upon location of building. Vegetated green roofs also require proper ballasting and the possible use of wind erosion mats.

K. General Contractor shall assure that adequate protection is provided after installation so other trades do not damage membrane.

1.10 WARRANTY

A. Upon completion of the work, the contractor shall supply the owner with a single-source warranty of U.S. origin direct from the manufacturer.

B. Each warranty varies in scope and terms.

C. Warranty:

1. Total System Warranties; covers components of the green roof assembly, including membrane, flashing, insulation, Garden Roof® components, vegetation and pavers. Includes removal and replacement of the Garden Roof® components, vegetation, pavers and soil (≤24 inches deep) when supplied by and installed per Hydrotech's requirements.

   A. Duration of Membrane/Flashing: 20-year
   (watertight condition)
   B. Duration of Insulation: 20-year
   (80% of original thermal value; remain on the deck withstanding wind speeds not to exceed 70 mph)
   C. Material Integrity of Garden Roof® Components: 15-year
   D. Extensive Vegetation: 2-year thrive coverage (min. 50% coverage after 1st year; 80% after 2nd)
   E. Duration of Pavers: 10-year
   (will not crack, split or disintegrate due to freeze-thaw)

PART II PRODUCTS

2.01 GENERAL

A. Refer to Section 1.04, System Description. All components shall be obtained as a single-source from the membrane manufacturer to ensure total system compatibility and integrity.

Manufacturer: American Hydrotech, Inc.
303 East Ohio Street
Chicago, Illinois 60611-3318
800-877-6125 or 312-337-4998
FAX: 312-661-0731
Web Site: http://www.hydrotechusa.com

2.02 MATERIALS

A. Membrane

1. Membrane shall be a hot, fluid applied, rubberized asphalt membrane meeting the CGSB-37.50-M89 standard and other pertinent physical properties:
   - American Hydrotech, Inc., Monolithic Membrane 6125EV® (minimum 25% post-consumer recycled-content)

PROPERTY	TEST METHOD	TYPICAL RESULT
Flash point	ASTM D-92 CGSB-37.50-M89	<500°F* (260°C)
Penetration	ASTM D-5329 CGSB-37.50-M89	98 mm @77°F (25°C) 187 mm @122°F (50°C)
Flow	ASTM D-5329 CGSB-37.50-M89	1.0 mm @ 140°F (60°C)
Toughness	CGSB-37.50-M89	16.0 Joules
Ratio of Toughness to Peak Load	CGSB-37.50-M89	0.069
Water Vapor Permeability	ASTM E-96, PROCEDURE E CGSB-37.50-M89	0.3 ng/Pa(s)M^2
Water Absorption	CGSB-37.50-M89	.11 gram weight gain
Low Temperature Flexibility (-25°C)	CGSB-37.50-M89	No delamination, adhesion loss, or cracking
Low Temperature Crack Bridging Capability	CGSB-37.50-M89	No cracking, adhesion loss, or splitting

Heat Stability	CGSB-37.50-M89	No change in viscosity, penetration, flow or low temperature flexibility
Viscosity	CGSB-37.50-M89	11.0 seconds
Water Resistance (5 days/50°C)	CGSB-37.50-M89	No delamination, blistering, emulsification, or deterioration
Softening Point	ASTM D-36	180°F (82°C)
Elongation	ASTM D-5329	1000% minimum
Resiliency	ASTM D-3407	40% minimum
Bond to Concrete	ASTM D-3407	Pass 0°F (-18°C)
Acid Resistance	ASTM D-896 Procedure 7.1 (N-8)	Pass-50% Nitric Acid -50% Sulfuric Acid
Resistance to Hydrostatic Pressure	ASTM D-08.22 Draft 2	100 psi (equals 231 foot of head water)
Resistance to Salt Water	ASTM D-896 similar 20% sodium chloride sodium carbonate calcium chloride	No delamination, blistering, emulsification or deterioration
Resistance to Fertilizer	ASTM D-896 similar undiluted, 15/5/5, nitrogen/phosphorus/potash	No delamination, blistering, emulsification or deterioration
Resistance to Animal Waste	3-year exposure	No deterioration
Solids Content		100%-no solvents
Shelf Life		10 years (sealed)
Specific Gravity		1.23 + .02

*102°F more than the application temperature recommended by the manufacturer.

B. Surface Conditioner

1. Asphaltic surface conditioner for concrete surfaces meeting ASTM D41 - American Hydrotech, Inc., Surface Conditioner

C. Reinforcing

1. Spunbonded polyester fabric (standard duty) reinforcing sheet.
   - American Hydrotech, Inc., Flex Flash F®
2. 60-mil (1.5 mm) thick, uncured neoprene (heavy duty) reinforcing sheet.
   - American Hydrotech, Inc., Flex Flash UN®

D. Flashing

1. 60-mil (1.5 mm) thick, uncured neoprene sheet.
   - American Hydrotech, Inc., Flex Flash UN®

E. Adhesives/Sealant

1. Contact adhesive to bond elastomeric flashing together.
   - American Hydrotech, Inc., Splicing Cement
2. Contact adhesive to bond elastomeric flashing to an approved substrate.
   - American Hydrotech, Inc., Bonding Adhesive
3. Sealant to seal elastomeric flashing seam edge.
   - American Hydrotech, Inc., Lap Sealant

F. Separation/Root Barrier Protection Course

1. Combination of a fiberglass reinforced rubberized asphalt protection sheet and polyethylene root barrier.
   - American Hydrotech, Inc., Hydroflex® 30/Root Stop

G. Prefabricated Drainage Course

1. Composite drainage system consisting of a three-dimensional, crush-proof, drainage core and a filter fabric.
   - American Hydrotech, Inc., Hydrodrain® 300

H. Insulation

1. Extruded polystyrene rigid board insulation.
   - STYROFOAM□ Brand insulation [TYPE] as manufactured by The Dow Chemical Company, marketed by American Hydrotech, Inc.
   a. Insulation shall meet ASTM C-578, Type VII.
   b. Minimum compressive strength, ASTM D-1621, 40 or 60 psi (276 or 414 kPa) (variance by type of product)
   c. Maximum water absorption by volume per ASTM C-272,0.1%
   d. Water vapor permeance for 1" product per ASTM E-96, 1.0 perm (max.) (63 ng/Pa/s/m^2)
   e. Insulation shall have an R value of 5.0°F ft^2 h/Btu/in. (0.88 K m^2/W) of thickness when tested at 75°F (23.9°C) mean temperature in accordance with ASTM C-518
   f. Product shall be free of CFC's

   Product types available: STYROFOAM® Brand, RoofMate; Ribbed RoofMate; PlazaMate; and High Load 100. CONSULT Hydrotech for recommended product type.

I. Air Layer

1. Required air space over STYROFOAM® insulation when moisture mat is required shall be composed of a crush-proof core and non-woven filter fabric.
- American Hydrotech, Inc., Hydrodrain® AL or Hydrodrain 300.

J. Water Retention Mat

1. Non-woven, synthetic fiber mat capable of retaining additional moisture for potential use by vegetation.
- American Hydrotech, Inc., Moisture Mat

K. Drainage/Water Retention Component

1. Three-dimensional, molded panels of recycled polyethylene with drainage channels top and bottom sides and water retention reservoirs top side.
- American Hydrotech, Inc., Gardendrain™
   a. Extensive Conditions:
      - Gardendrain GR30

L. Filter Fabric

1. Non-woven, polymeric, geotextile fabric.
- American Hydrotech, Inc., Systemfilter

M. Soil

1. Custom growing media mix capable of supporting vigorous growth of the specified vegetation, complying with the following specification.
- American Hydrotech, Inc., Extensive LiteTop® Growing Media

Property	**Extensive***
Grain Size Distribution	
clay fraction	< 1 %
passing #200 sieve	1-3 %
passing #60 sieve	5-25 %
passing #18 sieve	20-50 %
passing 1/8-inch sieve	55-95 %
passing 3/8-inch sieve	90-100 %
Density	
Application Density	0.6 - 1.1 g/cm3 (38 lbs – 69 lbs/cf)
Saturated Density	0.9 - 1.4 g/cm3 (56 lbs – 87 lbs/cf)
Dry Density	0.5 -1.0 g/cm3 (31 lbs – 62 lbs/cf)
Water & Air Management (% vol.)	
saturated water capacity	>30 %
saturated air content	>10 %
Saturated Hydraulic Conductivity	>0.6 mm/min (>1.4 in/hr)
pH, Lime, and Salt Content	
pH (saturated paste)	6.0 - 7.5

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carbonate content	<25 g/l
salts content (water extract)	<2.5 g/l (<1.7 mmhos/cm)
Organics	
OM content	3 – 6 mass %
C/N ratio	<20
Nutrients (plant available)**	in lb/1,000 ft3
nitrogen (NO3)	3 – 15
phosphorus	1 – 7
potassium	6 – 15
calcium	19 – 65
magnesium	3 – 15
CEC Capacity	>5 cmol/kg

Compost Fraction

1) Meet or exceed USEPA Class A standard, 40 CFR 503.13, Tables 1 & 3 (chemical contaminants) and 40 CFR 503.32(a) (pathogens) and/or be permitted in the state of origin to produce Class A material.
2) Meet US Compost Council STA/TMECC criteria or equal for Class I or II stable, mature product.

* Values shall be adjusted due to availability of local materials or special project conditions related to plant selection and/or environmental conditions.

** Nutrients shall be adjusted with appropriate slow-release fertilizer with micronutrient additions if below lower target range.

N. Erosion Control Mat & Stakes

1. Erosion Control Mat
   Composed of straw and/or coconut fiber stitched together with biodegradable thread forming top and bottom netting.
   - American Hydrotech, Inc., GardMat™ ST
2. Stakes
   100% biodegradable 4-inch organic plastic stakes used to fasten GardMat Erosion Control Mat
   - American Hydrotech, Inc. GardMat™ Stakes

O. Vegetation/Plantings

1. American Hydrotech, Inc. Garden Roof Extensive Plants™
   a. Plugs - 2-inch, 50-count plug trays
      -American Hydrotech, Inc. Garden Roof Extensive Plant Plugs™
2. Plugs shall be planted and maintained in accordance with Hydrotech's written specifications by an approved installer.
3. For plugs the typical planting list consists of 4-7 Sedum species and 2-3 herbaceous perennial species.

P. Hardscape / Roof Ballast

1. Pavers
   a. Architectural Pavers
      - American Hydrotech, Inc., Architectural Pavers, meeting the following physical properties:

PROPERTY	TEST METHOD	VALUES
Compressive Strength	ASTM C140	≥8,500 psi average min.
Flexural Strength	ASTM C293	≥1,100 psi average min.
Water Absorption	ASTM C140	Not greater than 5%
Freeze/Thaw	ASTM C67	≤1% loss/dry weight (50 cycles)
Centerload	-	Min. 1,750 lbs.

b. Architectural Finish Pavers
- American Hydrotech, Inc., Architectural Pavers, meeting the following physical properties:

PROPERTY	TEST METHOD	VALUES
Compressive Strength	ASTM C140	≥7,000 psi average min.
Flexural Strength	ASTM C293	≥600 psi average min.
Water Absorption	ASTM C140	Not greater than 5%
Freeze/Thaw	ASTM C67	≤1% loss/dry weight (50 Cycles)
Centerload	-	Min. 1,750 lbs.

2. Stone Ballast
Well screened and washed stone gravel meeting ASTM D-448-80, gradations #57, 2, 4 or 5 (as directed by Dow Chemical Company, TechNote 508 Ballast Design Guide for IRMA Roofs).

2.03 RELATED MATERIALS

A. Metal counter flashing is typically required to provide protection to vulnerable flashing materials from damage due to gardening activities.

PART III EXECUTION

3.01 INSPECTION

A. The roofing contractor shall examine all surfaces to receive the roofing assembly to verify it is acceptable and proper for the application of the membrane.

B. The roofing contractor shall not proceed with the installation of the roof membrane assembly until all roof defects have been corrected.

3.02 PREPARATION

A. All surfaces shall be dry, smooth, free of depressions, voids, protrusions, clean and free of unapproved curing compounds, form release agents and other surface contaminants. (Edit to project requirements)

1. Cast in-place concrete/Composite deck

   a. Poured in place concrete shall be monolithic, smooth, free of voids, spalled areas, laitance, honeycombs, and sharp protrusions.
   b. Refer to Section 1.02 of this specification, Division 3.

2. Precast concrete decks

   a. Precast units shall be mechanically secured to minimize differential movement and all joints between units shall be grouted.

3. Plywood decks

   a. Minimum thickness of 1/2" (12.7 mm) is required with adequate structural support.
   b. Tongue and groove joint edges are required.
   c. Adequate number and type of fasteners shall be used to comply with applicable codes and maintain structural integrity.

4. Metal Deck with Gypsum board

   a. Gypsum board (min. 5/8" thickness - 15.9 mm) shall be fire rated type "X" board mechanically attached to minimum 22 gauge steel decking with adequate structural support.
   b. Adequate number and type of fasteners shall be used to comply with board manufacturer's minimum requirements and applicable codes and maintain structural integrity.

5. Re-Roof/Tear-Off Application

   a. Asphalt, coal tar pitch or other existing membrane shall be removed. CONTACT Hydrotech.
   b. Deck type acceptable to Hydrotech.

B. Substrate cleaning

1. Thoroughly sweep the substrate which is to receive the roof membrane.

2. Substrate shall also be blown clean using an air compressor to remove any remaining loose debris.

3. Final check to determine if concrete has been properly cleaned is to apply a test patch of Monolithic Membrane 6125 to the surface and check its adhesion.

3.03 INSTALLATION

A. Surface conditioner application (to concrete)

1. Apply the surface conditioner only to concrete using a hand held sprayer evenly at a rate of 300 to 600 SF/gallon (7.4 - 14.7 m^2/L) depending on surface texture. Surface conditioner shall "tan" the surface, not blacken it.

2. Allow sufficient time for the surface conditioner to thoroughly dry prior to the membrane application.

B. Membrane preparation

1. The membrane shall be heated in double jacketed, oil bath or hot air melter with mechanical agitation, specifically designed for the preparation of a rubberized asphalt membrane.

2. Heat membrane until membrane can be drawn-free flowing at a temperature range between 350°F (176°C) and 375°F (190°C).

C. Detailing/Flashing

1. All detailing and flashing shall be done in accordance with the manufacturer's standard guideline details.

2. All detailing and flashing shall be completed before installing the membrane over the field of the substrate.

3. Substrate board joints shall be pre-detailed with membrane and fabric reinforcing prior to full membrane application.

D. Membrane Application

1. Apply the rubberized asphalt membrane at a rate to provide a continuous, monolithic coat of 90 mil minimum (approximately 2.3 mm), into which is fully embedded a layer of the spunbonded polyester fabric reinforcing sheet, followed by another continuous monolithic coat of membrane at an average thickness of 125 mil (approx. 3.2 mm). Total membrane thickness is to be 215 mils average (approx. 5.5 mm), 180 mils minimum.

2. Overlap fabric reinforcing sheet 1-2 inches (25.4 mm - 50.8 mm) with membrane between sheets.

3. Pre-detailing of joints between plywood and gypsum board decks is required.

3.04 SEPARATION/PROTECTION COURSE INSTALLATION

A. Separation/Protection course shall be installed as follows:

1. Embed the Hydroflex 30 separation/protection course into the membrane while it is still hot to insure a good bond. Installation of a separation course is necessary in order to carry out the water test.
   a. Overlap adjoining sheet edges (dry) a minimum of 2"-3" (50.8 mm - 76.2 mm) to insure complete coverage.

3.05 WATER TEST

A. The roof area or portions thereof shall be leak tested by means of electronic testing or by ponding water at a minimum depth of 2" (50.8 mm) for a period of 48 hours to check the integrity of the membrane installation.

C. VERIFY that the structure can support the deadload weight of a watertest before testing.

C. If leaks should occur the water shall be drained completely and the membrane installation repaired.

3.06 GARDEN ROOF COMPONENTS INSTALLATION

A. Root Barrier Protection. Root Stop shall be laid over the Hydroflex 30, lapping adjacent sheets 5 feet (1.5 m), or 1 foot (300 mm), overlap is acceptable if Seam Tape is used. The Root Stop shall be turned up all vertical, roofed/flashed surfaces to completely protect waterproofing and flashings.

B. Insulation. Where specified, STYROFOAM® brand insulation shall be installed loose-laid in accordance with manufacturer's recommendations.

C. Air Layer. When insulation ***and*** Moisture Mat are specified an air layer shall be required between the surface of the insulation and the water retention mat. A layer of Hydrodrain AL or 300 shall be installed over the insulation. The 4 inch (100 mm) salvage edge of the geotextile fabric overlaps adjoining sheets and can be held in place with duct tape.

D. Moisture Mat. Where specified, a layer of Moisture Mat shall be installed over the root barrier (when no insulation is specified) or air layer/ insulation, lapping adjacent rolls a minimum of 4 inches (100 mm). The Moisture Mat shall be turned up all vertical, roofed/flashed surfaces a minimum of 6 inches (150 mm) beyond the anticipated soil level. Any excess shall be trimmed down to the level of the soil.

E. Drainage/Water Retention Component. (Edit to project requirements)

1. Gardendrain™ GR15, Gardendrain™ GR30, shall be installed with holes through the dimples on top, over the root barrier protection, water retention mat (if used) or STYROFOAM® insulation (if used). Adjacent panels shall be butt together or overlapped approximately 1 inch (25 mm). Gardendrain shall be cut to fit around penetrations, etc. with a heavy-duty utility knife or small toothed saw.

F. Filter Fabric. (Edit to project requirements)

1. A layer of Systemfilter shall be laid over the Gardendrain, lapping adjacent rolls a minimum of 6 inches (150 mm). Enough material shall be left to be drawn up above the anticipated soil level. Any excess shall be trimmed down to the level of the soil.
   a. For slopes ≥2:12 and <3:12 (approx. 10 - 15°, 17 - 25%) filter fabric shall not be installed over the Gardendrain GR30 (only) throughout the field of the roof so that the growing media shall be placed directly into the cups. Filter fabric shall be laid at penetrations, terminations, etc.

3.07 HARD SCAPE/ACCESSORY INSTALLATION

A. Stone and/or paver ballast shall be installed at all roof perimeters, building walls, penetrations, and access hatches and as required for flashing vegetation barriers, proper wind design, fire breaks, and as walkway/maintenance paths.

1. Ballast design shall be in accordance with Dow Chemical Company TechNote 508 Ballast Design Guide for IRMA Roofs, and other applicable codes or wind design guides.

B. All drains shall be fitted with inspection/maintenance boxes and grills, built up to ensure access at soil level.

3.08 SOIL INSTALLATION

A. LiteTop soil shall be placed carefully to avoid damage or displacement of other materials such as walls, paving, drainage components, filter fabric, and roofing membrane.

B. LiteTop soil shall be placed to within 1 inch greater than final grade or to a depth of no greater than 8 inches and compacted as described in 3.08.C. below. For final grades less than 8 inches only one round of compaction shall be performed and remaining soil loosely placed such that top of soil exceeds final grade by 1 inch (see 3.08.D. below). For final grades greater than 8 inches, place soil at no greater than 6 inches and repeat procedure until soil has been compacted within 1 inch of final grade.

C. Compaction shall be performed with a 200 – 300 lb. landscape roller or lightly compacted with a hand held mechanical compactor to achieve a 50 – 60 % compaction as determined by ASTM D1557.

D. After compaction remaining soil shall be placed at 1 inch greater than final grade and thoroughly watered or jetted over entire area. Low settled areas shall be filled with additional soil and re-wet to achieve uniform prescribed final grade.

E. Erosion Control Mat. (Edit to project requirements)

1. The erosion control mat shall be installed directly over the growing media and properly staked into place.
   a. Stake fastening pattern is based on local wind speed, building height and roof slope. Contact Hydrotech for specific guidelines.
   b. Erosion control mat is not required when Sedum Carpet is installed; however the Sedum Carpet shall be staked in place as required.

3.09 VEGETATION INSTALLATION

A. Vegetation planting and initial maintenance shall be in accordance with the Hydrotech Extensive Garden Roof Plants Installation and Maintenance Guideline.

END OF SECTION 077101

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes joint sealants.

1.2 SUBMITTALS

A. Product Data: Submit product data for each joint sealant product indicated.

B. Samples: Submit samples for each exposed joint sealant product indicated.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers. Store and handle materials in compliance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. VOC Content for Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

B. Colors: For fully concealed joints, provide the manufacturer's standard color of sealant which has the best overall performance characteristics for the application shown. For exposed joints, the Architect will select colors from the manufacturer's standard colors.

2.2 JOINT SEALANTS

A. Butt Glazing Sealant: Comply with ASTM C920, Type S, Grade NS, Class 25; use NT, G, and A, black color unless otherwise indicated.

   1. Products: Provide one of the following:

      a. 795 Silicone Building Sealant; Dow Corning Corporation.
      b. Spectrem 2; Tremco, an RPM Co.

B. Sealants for Contact with Food: Comply with 21 CFR 177.2600, NSF Standard 51, and ASTM C920.

   1. Product:

      a. Dow Corning; 786 Mildew Resistant Silicone Sealant.

C. Mildew-Resistant Silicone Sealant (use for joints at plumbing fixtures, toilet room countertops and vanities): Complying with ASTM C920, Type S (single component), Grade NS (non-sag), class 25, Use NT (non-traffic), Substrate uses G, A, and O; and containing a fungicide for mildew resistance.

1. Products: Provide one of the following:

   a. Dow Corning; 786 Mildew Resistant Silicone Sealant.
   b. Pecora Corporation; 898 Silicone Sanitary Sealant.
   c. Tremco, an RPM Co.; Tremsil 200.

D. Latex Sealant: Complying with ASTM C 834, Type P (opaque sealants), Grade NF:

1. Products: Provide one of the following:

   a. Pecora Corporation; AC-20 + Silicone.
   b. Sonneborn Building Products Div., ChemRex, Inc.; Sonolastic Sonolac.
   c. Tremco, an RPM Co.; Tremflex 834.

2.3 MISCELLANEOUS MATERIALS

A. 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 with joint substrates.

B. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and which will not stain nor mar the finish of surfaces adjacent to joints to which it is applied.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with the recommendations of joint sealant manufacturer and the following requirements:

1. Remove 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), existing joint sealants, oil, grease, water, and surface dirt.
2. Clean concrete, masonry, unglazed surfaces of tile, and similar 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 from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of tile, and other 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.

B. 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.

C. Installation of Sealants: Install sealants so they directly contact and fully wet joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths that allow optimum sealant movement capability.

D. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform, concave shaped beads, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint.

E. Cleaning: Clean excess sealants or sealant smears adjacent to joints as installation progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.2 JOINT SEALANT SCHEDULE

A. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

1. Control and Expansion Joints on Exposed Interior Surfaces of Exterior Walls: Latex sealant.
2. Perimeter Joints of Exterior Openings Where Indicated: Latex sealant.
3. Tile Control and Expansion Joints: Latex sealant.
4. Vertical Control Joints on Exposed Surfaces of Interior Unit Masonry and Concrete Walls and Partitions: Latex sealant.
5. Joints on Underside of Precast Beams and Planks: Latex sealant.
6. Perimeter Joints between Interior Wall Surfaces and Frames of Interior Doors, Windows, and Elevator Entrances: Latex sealant.
7. Joints between Plumbing Fixtures and Adjoining Walls, Floors, and Counters: Mildew resistant silicone sealant.
8. Joints between Glass, and between Glass and Adjacent Substrates: Butt glazing sealant.

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SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes hollow metal doors and frames.

1. The integration of a security system into the hollow metal door and frame work is required. The Contractor shall be responsible for the total and complete coordination of the security system components into the Work.

1.2 SUBMITTALS

A. Product Data: Submit product data for each product indicated. Include material descriptions, core descriptions, label compliance, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

B. Shop Drawings: Submit door and frame schedule using same reference designations indicated on Drawings. Include opening size(s), handing of doors, frame throat dimensions, details of each frame type, elevations of door design types, details of construction, location and installation requirements of door hardware and reinforcements, hardware group numbers, details of joints and connections, fire label requirements including fire rating time duration, maximum temperature rise requirements, and smoke label requirements.

1. Indicate routing of electrical conduit and dimensions and locations of cutouts in doors and frames to accept electric hardware devices.

C. Construction Samples, approximately 18 by 24 inches (450 by 600 mm), representing the required construction of doors and frames for Project.

1. Doors: Show vertical-edge, top, and bottom construction; insulation; face stiffeners; and hinge and other applied hardware reinforcement. Include glazing stops if applicable.
2. Welded Frames: Show profile, welded corner joint, welded hinge reinforcement, dust-cover boxes, floor and wall anchors, stops, and silencers. Include glazing stops if applicable.
3. Knock-Down Frames: Show profile, corner joint, welded hinge reinforcement, wall anchors, stops, and silencers.

D. Certificate of Compliance for Fire Rated Doors: Provide copies of Certificate of Compliance for all fire rated door assemblies, all smoke and draft control door assemblies, and all temperature rise rated door assemblies.

E. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

1.3 QUALITY ASSURANCE

A. Hollow Metal Door and Frame Standard: Comply with the applicable provisions and recommendations of the following publications by Hollow Metal Manufacturers Association (HMMA) Div. of National Association of Architectural Metal Manufacturers (NAAMM), unless more stringent requirements are indicated in the Contract Documents:

1. HMMA "Hollow Metal Manual".
2. HMMA 861 "Guide Specifications for Commercial Hollow Metal Doors and Frames".

B. Manufacturer Qualifications: A firm experienced in manufacturing hollow metal doors and frames 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.

C. Fire-Rated Door 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 252 or UL 10C "Standard for Positive Pressure Fire Tests of Door Assemblies". Fire classification labels at all doors with fire ratings greater than 20 minutes shall indicate the temperature rise developed on the unexposed surface of the door after the first 30 minutes of fire exposure.

1. Provide metal labels permanently fastened on each door which is within the size limitations established by the labeling authority having jurisdiction.
2. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
3. Positive Pressure Rated Door Assemblies: Where indicated provide positive pressure rated fire rated door assemblies. Sizes and configurations as shown on the drawings. Installed door assemblies shall be in accordance with door manufacturers certified assemblies.

    a. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches (1000 mm) or less above the sill.
4. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

D. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257 or UL 9.

E. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage.

B. Inspect doors and frames, on delivery, for damage. Tool marks, rust, blemishes, and any other damage on exposed surfaces will not be acceptable. Remove and replace damaged items as directed by Architect. Store doors and frames at building site in a dry location, off the ground, and in such a manner as to prevent deterioration.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Specified Gage Thickness: All specified gauge thicknesses are Manufacturer's Standard Gauge.

B. Hot-Rolled Steel Sheets: ASTM A 1008/A 1008M, CS (commercial steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Cold-Rolled Steel Sheets: ASTM A 1011/A 1011M, CS (commercial steel), Type B, free from scale, pitting, coil breaks, or other defects, exposed (matte) dull finish.

D. Inserts, Bolts, and Fasteners: Galvanized steel.

1. Expansion Bolts and Shields: FS FF-S-325, Group III, Type 1 or 2.
2. Machine Screws: FS FF-S-92, carbon steel, Type III cross recessed, design I or II recess, style 2C flat head.

E. Filler: Sound deadening and heat retarding mineral fiber insulating material.

F. Glass and Glazing: Refer to Division 8 Section 'Glazing'.

2.2 DOORS

A. General: Provide flush-design doors, 1-3/4 inches (44 mm) thick, of seamless hollow construction, unless otherwise indicated. Construct doors with sheets joined at their vertical edges by continuous welding the full height of the door, with no visible seams on their faces or vertical edges, and all welds ground and finished flush.

1. Visible joints or seams around glazed panel inserts are permitted.
2. For single-acting swing doors, bevel both vertical edges 1/8 inch in 2 inches (3 mm in 50 mm).
3. For double-acting swing doors, round vertical edges with 2-1/8-inch (54-mm) radius.

B. Interior Door Core Construction: Provide one of the following core constructions welded to both door faces:

1. Steel-Stiffened Core: 20 gauge (0.032-inch) (0.8-mm) steel vertical stiffeners extending full-door height, spaced not more than 6 inches (150 mm) apart and spot welded to face sheets a maximum of 5 inches (127 mm) o.c. Place filler between stiffeners for full height of door.
2. Continuous Truss-Form Inner Core: 28 gauge thick steel reinforcement spot welded to face sheets a maximum of 2-3/4 inches (69.9 mm) o.c. vertically and horizontally.

C. Fire Door Cores: A continuous mineral fiberboard core permanently bonded to the inside face of the outer face sheet unless otherwise required to provide fire-protection and temperature-rise ratings indicated.

D. Astragals: As required by NFPA 80 to provide fire ratings indicated.

E. Top and Bottom Channels: Spot weld metal channels, having a thickness of not less than thickness of face sheet, not more than 6 inches (150 mm) o.c. to face sheets.

1. Reinforce tops and bottoms of doors with inverted horizontal channels of same material as face sheet so flanges of channels are even with bottom and top edges of face sheets.

F. Hardware Reinforcement: Fabricate reinforcing from the same material as door to comply with the following. Offset reinforcement so that faces of mortised hardware items are flush with door surfaces.

1. Hinges and Pivots: 7 gauge (0.167 inch) (4.2 mm) thick by 1-1/2 inches (38 mm) wide by 9 inches (229 mm).
2. Lock Front, Strike, and Flushbolt Reinforcements: 12 gauge (0.093 inch) (2.3 mm) thick by size as required by hardware manufacturer.
3. Lock Reinforcement Units: 14 gauge (0.067 inch) (1.7 mm) thick by size as required by hardware manufacturer.
4. Closer Reinforcements: 12 gauge (0.093 inch) (2.3 mm) thick one piece channel by size as required by hardware manufacturer.
5. Other Hardware Reinforcements: As required for adequate strength and anchorage.
6. In lieu of reinforcement specified, hardware manufacturers recommended reinforcing units may be used.
7. Exit Device Reinforcements: 0.250 inch (6.35 mm) thick by 10 inches (245 mm) high by 4 inches (101 mm) wide centered on exit device case body, unless otherwise recommended by exit device manufacturer.

G. Electrical Requirements: Make provisions for installation of electrical items specified elsewhere; arrange so wiring can be readily removed and replaced.

1. Provide all cutouts and reinforcements required for hollow metal doors to accept security system components.
2. Doors with Electric Hinges and Pivots: Provide with metal conduit or raceway to permit wiring from electric hinge or pivot to other electric door hardware.

a. Hinge Location: Center for doors less than 90 inches (2286 mm) tall or second hinge from door bottom for doors greater than 90 inches (2286 mm); top or bottom electric hinge locations shall not be permitted.

H. Interior Hollow Metal Doors:

1. Typical Interior Doors: Flush design with 18 gauge (0.042-inch-) (1.06-mm-) thick cold-rolled stretcher-leveled steel face sheets and other metal components from hot- or cold-rolled steel sheets.
2. Extra Heavy Use Doors: Flush design with 14 gauge (0.067-inch-) (1.7-mm-) thick cold-rolled, stretcher-leveled steel face sheets and other metal components from hot- or cold-rolled steel sheets. Provide only where indicated.

2.3 FULL GLAZED STILE AND RAIL DOORS

A. Form doors with stiles and rails of continuous steel channels, fabricated from not lighter than 16 gauge (0.053 inch) (1.3 mm) thick cold rolled steel, welded together to form a rigid tubular frame. Door corners shall be mitered and butted. Mitered joints shall be internally reinforced,

welded, and ground smooth such that no miter joints appear on the door faces. Intermediate rails shall be butted and internally welded to door stiles. Continuously weld all joints for the full height of the door, with no visible seams on their faces, horizontal, or vertical edges, and all welds ground and finished flush.

2.4 DUTCH DOORS

A. Fabricate as specified for flush doors. Provide shelf with boxed edges and closed ends; fabricate from 16 gauge (0.053 inch) (1.3 mm) thick cold rolled steel sheet. Support shelf on door manufacturers standard steel brackets, unless otherwise indicated.

2.5 PANELS

A. Provide panels of same materials, construction, and finish as specified for doors.

2.6 FRAMES

A. Fabricate hollow metal door frames, formed to profiles indicated, with full 5/8 inch (16 mm) stops, and of the following minimum thicknesses.

1. For interior use, form frames from cold- rolled steel sheet of the following thicknesses:

a. Openings up to and Including 48 Inches (1200 mm) Wide: 16 gauge (0.053 inch) (1.3 mm).
b. Openings More Than 48 Inches (1200 mm) Wide: 14 gauge (0.067 inch) (1.7 mm).

B. Provide frames either saw mitered and full (continuously) profile welded, or machine mitered and full (continuously) profile welded, on back side at frame corners and stops with edges straight and true. Grind welds smooth and flush on exposed surfaces.

C. Hardware Reinforcement: Fabricate reinforcements from same material as frame to comply with the following. Offset reinforcement so that faces of mortised hardware items are flush with surface of the frame.

1. Hinges and Pivots: 7 gauge (0.167 inch) (4.2 mm) thick by 1-1/4 inches (32 mm) wide by 10 inches (254 mm).
2. Strike, Surface Mounted Hold Open Arms, and Flushbolt Reinforcements: 12 gauge (0.093 inch) (2.3 mm) thick by size as required by hardware manufacturer.
3. Closer Reinforcements: 12 gauge (0.093 inch) (2.3 mm) thick one piece channel by size as required by hardware manufacturer.
4. Other Hardware Reinforcements: As required for adequate strength and anchorage.

D. Electrical Requirements: Make provisions for installation of electrical items specified elsewhere; arrange so wiring can be readily removed and replaced.

1. Provide all cutouts and reinforcements required for hollow metal frames to accept security system components.
2. Frames with Electric Hinges and Pivots: Provide welded on UL listed back boxes with metal conduit or raceway to permit wiring from electric hinge or pivot to other electric door hardware.

a. Hinge Location: Center for doors less than 90 inches (2286 mm) tall or second hinge from door bottom for doors greater than 90 inches (2286 mm); top or bottom electric hinge locations shall not be permitted.

E. Mullions and Transom Bars: Provide closed or tubular mullions and transom bars where indicated. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between frame members with concealed clip angles or sleeves of same metal and thickness as frame.

F. Jamb Anchors: Locate jamb anchors above hinges and directly opposite on strike jamb as required to secure frames to adjacent construction. At metal stud partitions locate the additional jamb anchor below the top hinge.

1. Masonry Construction: Adjustable, corrugated or perforated, anchors to suit frame size; formed of same material and gauge thickness as frame; at non-rated frames use friction fit T-shaped anchors, at rated frames use anchors consisting of spot welded strap and adjustable anchor; with leg not less than 2 inches (50 mm) wide by 10 inches (250 mm) long. Furnish at least the number of anchors per jamb according to the following frame heights:

   a. Two anchors per jamb up to 60 inches (1500 mm) in height.
   b. Three anchors per jamb from 60 to 90 inches (1500 to 2250 mm) in height.
   c. Four anchors per jamb from 90 to 96 inches (2250 to 2400 mm) in height.
   d. One additional anchor per jamb for each 24 inches (600 mm) or fraction thereof more than 96 inches (2400 mm) in height.

2. Metal-Stud Partitions: Metal channel stud zee anchor sized to match stud width, welded to back of frames, formed of same material and gauge thickness as frame. Provide at least the number of anchors for each jamb according to the following heights:

   a. Three anchors per jamb up to 60 inches (1500 mm) in height.
   b. Four anchors per jamb from 60 to 90 inches (1500 to 2250 mm) in height.
   c. Five anchors per jamb from 90 to 96 inches (2250 to 2400 mm) in height.
   d. One additional anchor per jamb for each 24 inches (600 mm) or fraction thereof more than 96 inches (2400 mm) in height.

3. In-Place Concrete or Masonry: Anchor frame jambs with minimum 3/8-inch- (9-mm-) diameter countersunk flat head bolts into expansion shields or inserts 6 inches (150 mm) from top and bottom of each jamb with intermediate anchors spaced a maximum of 26 inches (650 mm) o.c. Soffit face of frame shall be punched and dimpled to accept countersunk bolt head. Reinforce frame with spacer to prevent bowing. Bolt head shall be set slightly below soffit face, filled and ground smooth at time of installation.

G. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, formed of same material as frame, 12 gauge (0.093 inch) (2.3 mm) thick, and punched with two holes to receive two (2) 0.375 inch (9.5 mm) fasteners. Where floor fill or setting beds occur support frame by adjustable floor anchors bolted to the structural substrate. Terminate bottom of frames at finish floor surface.

H. Head Strut Supports: Provide 3/8-by-2-inch (9-by-50-mm) vertical steel struts extending from top of frame at each jamb to supporting construction above. Bend top of struts to provide flush contact for securing to supporting construction above by bolting, welding, or other suitable anchorage. Provide adjustable wedged or bolted anchorage to frame jamb members to permit height adjustment during installation. Adapt jamb anchors at struts to permit adjustment.

I. Head Reinforcement: For frames more than 48 inches (1200 mm) wide in masonry wall openings, provide continuous steel channel or angle stiffener, 12 gauge (0.093 inch) (2.3 mm) thick for full width of opening, welded to back of frame at head. Head reinforcements shall not be used as a lintel or load bearing member for masonry.

J. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions to serve as bracing during shipment and handling and to hold frames in proper position until anchorage and adjacent construction have been completed.

K. Door Silencer Holes: Drill strike jamb stop to receive three silencers on single door frames and for two silencers on double door frames. Insert plastic plugs in holes to keep holes clear during installation.

L. Plaster Guards and Removable Access Plates: Provide 26 gauge (0.016-inch-) (0.4-mm-) thick plaster guards or dust-cover boxes of same material as frame, welded to frame at back of hardware cutouts to close off interior of openings and prevent mortar or other materials from obstructing hardware operation. Provide removable access plates in the heads of frames to receive overhead concealed door closers.

2.7 STOPS AND MOLDINGS

A. Provide continuous stops and moldings around glazed panels where indicated.

B. Form fixed stops and moldings integral with frame, on the exterior (non-secured) side of the frame.

C. Provide removable stops and moldings formed of 20 gauge (0.032-inch-) (0.8-mm-) thick steel sheets matching hollow metal frames. Secure with countersunk oval head machine screws spaced uniformly not more than 12 inches (300 mm) o.c. Form corners with butted hairline joints.

D. Coordinate rabbet width between fixed and removable stops with type of glass or panel and type of installation indicated.

E. Provide terminated "hospital" stops on interior door frames where indicated on Drawings. Terminate stops 6 inches (150 mm) above finish floor with a 45-degree angle cut, and close open end of stop with hollow metal sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

2.8 KNOCKDOWN HOLLOW METAL FRAMES

A. Provide combination type knockdown hollow metal door frames to be used as both door buck and trim, formed to profiles shown, of minimum 16 gauge (0.053 inch) (1.3 mm) thick cold rolled steel.

1. Frames shall be splined, tabbed, and miter fit, knockdown type compatible with adjacent construction conditions.
2. Accurately machine, file, and fit exposed connections with hairline joints.
3. Typical Anchorage: Frames shall be provided with concealed mechanical compression anchors at top of each jamb and each jamb shall be prepared and provided with provision for anchorage at floor line of jamb return face.
4. Miter and anchorage type subject to acceptance of Architect.

B. Mortise, reinforce, drill and tap frames for mortise type hardware. Provide internal reinforcement for surface type hardware which is to be field drilled and tapped per requirements hereinbefore specified for welded frames and including silencers. Locate hardware in frames to match location specified and in accordance with the hardware schedule and templates.

2.9 FABRICATION

A. Fabricate doors and frames rigid, neat in appearance, and free of defects, warp, wave, and buckle. Accurately form metal to sizes and profiles indicated. Accurately machine, file, and fit exposed connections with hairline joints. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

B. Exposed Fasteners: Provide countersunk flat heads for exposed screws and bolts, unless otherwise indicated.

C. Hardware Preparation: Prepare doors and frames to receive hardware, including cutouts, reinforcement, mortising, drilling, and tapping, according to final hardware schedule and templates provided by hardware supplier. Secure reinforcement by spot welding. Comply with applicable requirements of ANSI A115 Series specifications for door and frame preparation for hardware. Factory reinforce doors and frames to receive surface-applied hardware. Factory drill and tap for surface-applied hardware, except at pushplates and kickplates provide reinforcing only.

1. Locate hardware as indicated on the drawings or in Division 8 Section 'Door Hardware' or, if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."

2.10 STEEL SHEET FINISHES

A. General: Clean, treat and prime surfaces of fabricated hollow metal door and frame work, inside and out, whether exposed or concealed in the construction.

B. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale, shavings, filings, and rust, if present, complying with SSPC-SP 3, "Power Tool Cleaning,"

C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after surface preparation and pretreatment. Apply a sufficient number of coats, baked on, to obtain uniformly smooth exposed surfaces. Touch up surfaces having runs, smears, or bare spots.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, corrosion-inhibiting, lead- and chromate-free, universal primer complying with ANSI A250.10 acceptance criteria; compatible with substrate and field-applied finish paint system indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install doors and frames according to DHI A115.IG, the Architect reviewed shop drawings, and manufacturer's written recommendations and installation instructions.

B. Frames: Install frames where indicated. Extend frame anchorages below fills and finishes. Coordinate the installation of built-in anchors for wall and partition construction as required with other work.

1. Knock-Down Frames: Install knock-down frames in locations shown, in perfect alignment and elevation, plumb, level, straight and true, and free from rack.
2. Welded Frames:

a. Set masonry anchorage devices where required for securing frames to in-place concrete or masonry construction.

1) Set anchorage devices opposite each anchor location as specified and anchorage device manufacturer's written instructions. Leave drilled holes rough, not reamed, and free of dust and debris.

b. Placing Frames: Set frames accurately in position; plumb; align, and brace securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1) At concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage devices. Anchor bottom of frames to floors with anchor bolts or power driven fasteners.
2) Field splice only at approved locations indicated on the shop drawings. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.

3. At fire-rated openings, install frames according to NFPA 80.
4. Existing Frames (Salvaged from Alteration Work): Install salvaged existing frames in locations indicated.

C. Doors:

1. Non-Fire Rated Doors: Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

a. Jambs and Head: 3/32 inch (2 mm).
b. Meeting Edges, Pairs of Doors: 1/8 inch (3 mm).
c. Bottom: 3/8 inch (9 mm), if no threshold or carpet.
d. Bottom: 1/8 inch (3 mm), at threshold or carpet.

2. Fire-Rated Doors: Install with clearances as specified in NFPA 80.
3. Smoke Control Doors: Install according to NFPA 105.
4. Existing Doors (Salvaged from Alteration Work): Install salvaged existing doors in locations indicated.

D. Wood Door Installation: Refer to Division 8 Section "Flush Wood Doors".

E. Apply hardware in accordance with hardware manufacturer's instructions and Division 8 Section 'Door Hardware'. Drill and tap for machine screws as required. Do not use self tapping sheet metal screws. Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Adjust hardware items just prior to final inspection. Leave work in complete and proper operating condition.

1. Field cut existing hollow metal doors and frames indicated to receive new hardware. Field cutting shall be executed in a workmanlike manner and shall not void the existing door and frame labeling.

3.2 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items just before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

1. Finish Painting: Refer to Division 9 Section "Painting".

C. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise defective.

D. Institute protective measures required throughout the remainder of the construction period to ensure that hollow metal doors and frames will be without any damage or deterioration, at time of substantial completion.

END OF SECTION 081113
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SECTION 081216 - INTERIOR ALUMINUM FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes extruded aluminum frames for interior locations.

1.2 SUBMITTALS

A. Product Data: Submit product data for each product indicated. Include material descriptions for each type of frame specified.

B. Shop Drawings: Submit shop drawings showing scaled elevations, plans, and sections of the interior aluminum frame work. Full scale sections shall be prepared and submitted for details of the assemblies that cannot be shown in the elevations or sections. Include with shop drawings glass thicknesses, metal finishes, and all other pertinent information as necessary or requested by the Architect to indicate compliance with the Contract Documents. Details of field connections, anchorage, and their relationship to the work of others shall be clearly indicated for the coordination of the work by other building trades. Details of fastening and sealing methods and product joinery shall be shown to ensure proper performance of the field installation.

C. Samples: Submit samples for each type of corner construction and each type of exposed finish required. Prepare samples from same material to be used for the Work. For finishes with normal color and texture variations, include sample sets showing full range of variations expected.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Subcontract the interior frame work to a firm who has successfully installed interior aluminum framing systems similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain aluminum frames through one source from a single manufacturer with the capacity and resources to provide products of consistent quality in appearance and physical properties.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging of components shall be so selected to protect the components from damage during shipping and handling.

B. Storage on Site: Store components in a location and in a manner to avoid damage to the components. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of metals.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify interior aluminum frame dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening and wall dimensions and note on Shop Drawings that these are not measured dimensions. Proceed with fabricating interior aluminum frames without field measurements. Coordinate wall, floor, and ceiling construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The interior aluminum frames work shown and specified is based on ALTech System products manufactured by the Custom Components Co. Inc., Tampa, FL. Interior aluminum frame products, by one of the following manufacturers, similar to those described in the specifications and indicated on the drawings may be considered and is subject to the acceptance of the Architect.

1. RACO Interior Products, Inc., Houston, TX.

2. Wilson Partitions, Vernon, CA.

2.2 MATERIALS

A. Fabricate interior aluminum frame components from aluminum extrusions complying with ASTM B 221 (ASTM B 221M), 'Anodizing Quality' and formed to the sizes, shapes, and profiles indicated; temper required to suit structural and finish requirements.

2.3 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic stainless-steel or zinc plated steel complying with ASTM A164.

B. Door Silencers (Mutes): Manufacturer's standard gray mohair.

C. Glazing Gaskets: Manufacturer's standard extruded or molded gray plastic or EPDM, to accommodate 6-mm- thick glass, unless otherwise indicated.

D. Glass: As specified in Division 8 Section "Glazing."

E. Hardware: As specified in Division 8 Section "Door Hardware."

2.4 SEALING MATERIALS

A. Exposed Sealing Materials: Acrylic latex type sealants, exposed at perimeter joints in contact with adjacent wallboard materials are specified in Division 8 Section 'Joint Sealants.'

2.5 FABRICATION

A. General: Fabricate the interior aluminum frames to the designs, shapes, and sizes shown using the materials specified and shown to produce assemblies which meet or exceed the performance requirements. To the greatest extent possible complete fabrication, assembly, finishing, hardware applications and other work before shipment to Project site.

1. Metal Wall Thickness: Provide shapes as shown and as required to suit the performance requirements but with wall thickness of not less than the following for each major component:

a. Door Frames: Extruded aluminum, not less than 0.062 inch thick, reinforced for hinges and strikes.

b. Door Stiles and Rails: Extruded aluminum, not less than 0.125 inch thick, reinforced for hinges and strikes.

c. Glass Frames: Extruded aluminum, not less than 0.062 inch thick, designed for glass thickness indicated.

d. Ceiling Tracks: Extruded aluminum, not less than 0.062 inch thick.

e. Trim: Extruded aluminum, not less than 0.050 inch thick, removable snap-in glass stops and door stops without exposed fasteners.

f. Frame Face Dimension: As indicated on the drawings.

2. Door Stile and Rail Dimensions:

a. Bottom rails: As indicated on the drawings.

b. Stile Dimensions: As indicated on the drawings.

c. Top Rail Dimensions: As indicated on the drawings.

d. Door Thickness: 1-3/4 inches.

e. Fabricate all doors and frames to accommodate the swing direction shown.

3. Glazing shall be performed in accordance with Section 08800, 'Glazing'.

B. Provide continuous glazing stops with concealed fasteners for all doors and frames. Provide stops with hairline joints at corners. Provide stops with square, not beveled, shouldered profile unless otherwise shown.

C. Cut, reinforce, drill and tap doors and frames in strict accordance with the printed door hardware manufacturers templates and instructions. Provide solid steel hardware reinforcements, securely fastened to doors and frames where door hardware is to be attached.

D. Joints in Metal Work: All exposed work shall be carefully fitted and matched to produce continuity of line and design, with all joints, being accurately fitted for hairline contact and rigidly secured.

1. Provide concealed corner reinforcements and alignment clips for precise butt or mitered connections.

2. Fabricate door stiles, door rails, and frames for glass to allow glass replacement without dismantling door or frame.

3. Fabricate all components to allow secure installation without exposed fasteners.

E. Shop Assembly: As far as practible, all fitting and assembly work shall be done in a fabrication shop.

2.6 ALUMINUM FINISHES

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

B. Finish Application: Apply coatings to all exposed surfaces of interior aluminum door and frame work.

C. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

D. Protective and Decorative, Finishes: Complying with the following:

1. Metal Preparation and Pretreatment: Remove die markings prior to finishing operations. Perform this work in addition to the finish specified. Scratches, abrasions, dents and similar defects are unacceptable.

2. Finish:

a. Anodized Finish: Medium matte (non-directional) finished, clear natural anodized complying with AA-M10C22A21 finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate interior aluminum door and frame work with the work of other Sections and provide items to be placed during the installation of other work at the proper time to avoid delays in the work.

B. Place such items, including concealed overhead framing, accurately in relation to the final location of interior aluminum door and frame components.

3.2 EXAMINATION

A. Examine walls, floors, and ceilings for suitable conditions where interior aluminum doors and frames are to be installed.

B. Verify that wall thickness does not exceed standard tolerances allowed by throat size indicated.

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

3.3 INSTALLATION

A. Comply with interior aluminum door and frame manufacturer's written installation instructions and the Architect reviewed shop drawings. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints.

B. Frame Installation: Install frames plumb and square, shimmed and then securely anchored to substrates with fasteners recommended by frame manufacturer.

1. Fasten to steel stud bulkhead framing using sheet metal screws or other fasteners approved by frame manufacturer in accordance with the accepted shop drawings.

a. Use concealed installation clips to ensure that splices and connections are tightly butted and properly aligned.
b. Secure clips to main structural extrusion components and not to snap-in or trim members.
c. Do not leave screws or other fasteners exposed to view when installation is complete.

C. Doors: Doors shall be securely anchored in place to a straight, plumb and level condition, without distortion. Adjust doors to operate smoothly, without binding, with hardware functioning properly. Weatherstripping contact, and hardware movement, shall be field tested and final adjustment, and lubrication, made for proper operation and performance of doors.

1. Door Hardware: Refer to Division 8 Section, "Door Hardware".

2. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.

3. Wood Door Installation: Refer to Division 8 Section, "Flush Wood Doors".

D. Install glazing to comply with requirements of Division 8 Section, "Glazing," unless otherwise indicated.

E. Install acrylic latex perimeter sealant to comply with requirements of Division 7 Section, "Joint Sealants," unless otherwise indicated.

3.4 CLEANING

A. Clean exposed surfaces of interior aluminum doors and frames promptly after installation, using cleaning methods recommended by interior aluminum door and frame manufacturer.

1. Clean and maintain anodized aluminum according to AAMA 609.

B. Wash glass on both faces not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer. Remove excess glazing and sealant compounds, dirt, and other substances.

C. Immediately remove any deleterious material from surfaces of aluminum.

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3.5 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that interior aluminum doors and frames work will be without damage or deterioration, at time of acceptance.

END OF SECTION 081216
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SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes solid core flush wood doors.

1. The integration of a security system into the flush wood door work is required. The Contractor shall be responsible for the total and complete coordination of the security system components into the Work.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of door required. Include factory-finishing specifications.

1. Submit laboratory test report results of hinge loading, cycle/slam, stile edge screw withdrawals, and stile edge split resistance for fire rated doors.

2. Include adhesive manufacturer's product data indicating urea-formaldehyde content.

B. Shop Drawings: Submit shop drawings indicating location, size, thickness, and hand of each door; elevation of each kind of door; construction details not covered in the product data; location and extent of hardware blocking; undercuts, special beveling, and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware of factory machined doors.
2. Indicate dimensions and locations of cutouts.
3. Indicate fire label requirements including fire rating time duration, maximum temperature rise requirements, and smoke label requirements.
4. Indicate routing of electrical conduit and dimensions and locations of cutouts in wood doors to accept electric hardware devices.

C. Samples: Cut away corner section of each door type approximately 8 by 10 inches (200 by 250 mm) demonstrating door construction, face veneer and finish.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with the applicable provisions and recommendations of AWI's "Architectural Woodwork Quality Standards Illustrated, 8th Edition, Version 1.0, Section 1300" where standards and specifications conflict the more stringent shall be required.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect wood doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in heavy duty cardboard cartons.

C. Handle wood doors with clean gloves. Lift and carry wood doors when moving them around the site, do not drag wood doors across one another.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until wet work , such as masonry, concrete, stone, tile, terrazzo, plastering, wallboard joint treatment, is complete and dried, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period. Do not expose doors to sudden changes in temperature such as forced heat used to dry out the site.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship for the life of the original installation of the door. A representative of the door manufacturer shall inspect the installed doors and shall note on the warranty that no provisions of the warranty have been nullified in the manufacture and/or installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance to requirements, provide products by one of the following:

1. Algoma Hardwoods, Inc. www.algomahardwoods.com
2. Eggers Industries, Architectural Door Division. www.eggersindustries.com
3. Marshfield Door Systems, Inc. www.marshfielddoors.com

2.2 MATERIALS

A. Low-Emitting Materials:
1. Provide doors made with adhesives and composite wood products that do not contain added urea-formaldehyde resins.

2.3 DOOR CONSTRUCTION

A. Adhesives: Do not use adhesives containing urea formaldehyde.

B. Doors for Transparent Finish:

1. Grade: Premium, with Grade AA faces.
2. Face Veneer Species and Cut: FSC Certified white birch, rotary cut matching Architect's samples.
3. Match between Veneer Leaves: Book match matching Architect's samples.
4. Assembly of Veneer Leaves on Door Faces: Center balance match.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Thickness: 1-3/4 inch (45-mm) unless otherwise indicated.
7. Materials:

a. Agrifiber Core Material: Complying with ANSI A208.1, Grade 1-LD-2.

1) Use agrifiber material made with binder containing no urea-formaldehyde resin.

b. Blocking: 5-1/2 inch (138-mm) wide minimum top-rail blocking at doors with closers and bottom rail blocking at doors with kickplates consisting of minimum 1/2 inch (13-mm) wide single length mill option hardwood outer band and single length mill option hardwood or structural composite lumber inner band.

c. Vertical Edges: 1-3/8 inch (35 -mm) wide minimum prior to fitting, 2 ply laminated wood construction consisting of a single piece hardwood outer band, without fingerjoints, and an inner band of mill option hardwood. Outer band to match face veneer for transparent finished veneered-faced doors. Trim non-rated door width equally on both jamb edges.

d. Crossbanding: Minimum 1/16 inch (1.5 -mm) thick, low density hardwood, composite, or high density hardboard.

8. Construction: AWI Section 1300, PC-5 ME. Stiles, rails, and blocking bonded to core then entire unit abrasive planed before veneering. Crossbanding materials shall extend full width of door with grain running horizontally, tapeless spliced without voids or show through (telegraphing), and directly glued to core and blocking. Sand cross banding before application of face veneer. Face veneer shall extend full height of door with grain running vertically, tapeless spliced without voids or show through (telegraphing), and directly glued to cross band. Glue lines between face veneer, crossbanding, and blocking shall be of a type to comply with the specified warranty using the hot plate process.

C. Doors for Opaque Finish:

1. Grade: Custom.
2. Face Veneer: Medium-density overlay.
3. Thickness: 1-3/4 inch (45-mm) unless otherwise indicated.
4. Materials:

a. Agrifiber Core Material: Complying with ANSI A208.1, Grade 1-LD-2.
1) Use agrifiber material made with binder containing no urea-formaldehyde.

b. Blocking: 5-1/2 inch (138-mm) wide minimum top-rail blocking at doors with closers and bottom rail blocking at doors with kickplates consisting of minimum 1/2 inch (13-mm) wide single length mill option hardwood outer band and single length mill option hardwood or structural composite lumber inner band.

c. Vertical Edges: 1-3/8 inch (35 -mm) wide minimum prior to fitting, 2 ply laminated wood construction consisting of a single piece hardwood outer band, without fingerjoints, and an inner band of mill option hardwood. Trim non-rated door width equally on both jamb edges.

d. Crossbanding: Minimum 1/16 inch (1.5 -mm) thick, low density hardwood, composite, or high density hardboard.

5. Construction: AWI Section 1300, PC-5 CE. Stiles, rails, and blocking bonded to core then entire unit abrasive planed before veneering. Crossbanding materials shall extend full width of door with grain running horizontally, tapeless spliced without voids or show through (telegraphing), and directly glued to core and blocking. Sand cross banding before application of face veneer. Face veneer shall extend full height of door with grain running vertically, tapeless spliced without voids or show through (telegraphing), and directly glued to cross band. Glue lines between face veneer, crossbanding, and blocking shall be of a type to comply with the specified warranty using the hot plate process.

D. Wood Beads for Light Openings in Wood Doors: Manufacturer's standard flush designed, solid wood, rectangular shaped, back beveled or quirked, beads matching veneer species of door faces. Include glazing compounds or tapes sized for back bevel or quirk provided. Include finish nails for removable stops sized in accordance with wood door manufacturers recommendations.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3 unless otherwise indicated to match existing frame hardware preparations. Comply with final hardware schedules, door frame Shop Drawings, AWI Section 1300-G-20, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in frames to verify dimensions and alignment before factory machining.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required. Install light beads with fasteners spaced for opening size and fire rating indicated. Install wood bead moldings with finish nails and countersink without striking bead. Fill countersunk heads with putty matching wood bead color.

2.5 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime faces and edges of doors, including cutouts, with one coat of wood primer/sealer as standard with door manufacturer. Surfaces shall be clean and dry before priming. Apply primer/sealer uniformly without bare spots, runs, or sags.

2.6 FACTORY FINISHING

A. General: Finish doors at factory that are indicated to receive transparent finish.

B. Grade: Premium.

C. Finish: Manufacturer's standard finish with performance meeting or exceeding either AWI System TR-4 conversion varnish or AWI System TR-6 catalyzed polyurethane.

D. Staining: Prepare door faces, stiles, rails, and cutouts, with toners, or stains, prior to the application of finish to match Architect's sample.

E. Effect and Sheen: Match Architect's sample.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: Apply hardware to new and existing doors in accordance with hardware manufacturers instructions and Division 8 Section "Door Hardware." For particleboard core

doors drill pilot holes of proper size for installing hinge screws. Adjust hardware items just prior to final inspection. Leave work in complete and proper operating condition.

1. Factory wrapping shall be maintained on new doors during construction period, and all hardware shall be installed by cutting the factory wrapping at the mounting location of the hardware item.

B. General Door Installation Standards: Install doors in locations indicated to comply with manufacturer's written instructions, referenced quality standard, and as indicated. Where standards conflict the more stringent shall apply.

1. Install fire-rated doors in corresponding fire-rated frames according to fire label requirements.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; and to contact stops uniformly, do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Field cutting, fitting or trimming, shall be executed in a workmanlike manner. Machine doors for hardware. Seal cut and trimmed surfaces immediately after fitting and machining using clear varnish or sealer.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge, matching clearances specified for factory prefitting, and to contact stops uniformly. Field cutting, fitting or trimming, if required, shall be executed in a workmanlike manner.

E. Existing Wood Doors (Salvaged from Alteration Work): Install salvaged existing wood doors in locations indicated. Field cutting, fitting or trimming, if required, shall be executed in a workmanlike manner.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

G. Field-Finished Doors: Refer to the following for finishing requirements:

1. Division 9 Section "Painting."

3.2 ADJUSTING AND PROTECTION

A. Rehang or replace doors that do not swing or operate freely.

B. Protection: Protect wood doors to ensure that the wood door work will be without damage or deterioration at the time of Substantial Completion.

1. Refinish or replace wood doors damaged during installation. Replace any new wood doors that are warped, twisted, demonstrate core show through, are not true in plane, or cannot be refinished to the satisfaction of the Architect.

END OF SECTION 081416

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SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes access doors and frames.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of access door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.

B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:

1. Method of attaching door frames to surrounding construction.

2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

C. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain access doors of each type for entire project from one source from a single manufacturer.

B. Size and Location Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule.

1.4 COORDINATION

A. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and where shown on the drawings, and indicate on schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Flush Access Typical Doors and Trimless Frames for Vertical Surfaces: Fabricated from steel sheet.

1. Locations: Gypsum board wall surfaces.
2. Door: Minimum 14 ga. thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 16 ga. thick sheet metal with drywall bead.
4. Hinges: Continuous concealed type.

5. Latch: Flush, screwdriver- operated cam latch of number required to hold door in flush, smooth plane when closed.
6. Products: One of the following:

    a. Larsen's Industries, Inc.; Model L-DWC.
    b. Milcor; Style DW.
    c. Nystrom, Inc.; NW Series.

B. Flush Access Typical Doors and Trimless Frames for Horizontal Surfaces: Fabricated from glass fiber reinforced gypsum.

1. Locations: Gypsum board ceiling surfaces.
2. Door: Minimum 1/8" thick glass fiber reinforced gypsum, set flush with surrounding gypsum wallboard finish surfaces.
3. Frame: Minimum 1/8" thick glass fiber reinforced gypsum, with tapered square edge.
4. Hinges and Latch: None, lay-in manual push up type.
5. Product:

    a. Chicago Metallic Ceiling Systems and Specialty Products: Glass Reinforced Gypsum Drywall Ceiling Access Doors.
    b. Formglas, Inc.: Interior Ceiling Access Panel.

2.2 FABRICATION

A. General: Provide access door assemblies manufactured as integral units ready for installation.

B. Steel Access Doors: Fabricate units of continuous welded steel construction. Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Provide special sized access doors where required or requested.

C. Glass Fiber Reinforced Gypsum Doors: Fabricate units of monolithic glass fiber reinforced gypsum construction having a shell thickness of between 1/8" to 3/16" and weighing approximately 2 pounds per square foot. Edges of doors shall be rabbetted to overlap and rest on the frame.

1. Provide special sized access doors where required or requested.

D. Frames:

1. Exposed Flanges: Nominal 1 to 1-1/2 inches (25 to 38 mm) wide around perimeter of frame for steel frames.
2. Provide trimless carbon steel frames with drywall bead for installation in gypsum wallboard assembly, furnish perforated frames with drywall bead, securely attached to perimeter of frames, in size to suit thickness of gypsum panels indicated. Provide mounting holes in frames to attach frames to metal framing in drywall construction.
3. Provide trimless glass fiber reinforced frames with tapered edges for taping and joint compound installation into gypsum wallboard ceiling assembly, in size to suit thickness of gypsum panels used.

2.3 CARBON STEEL FINISHES

A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions for installation of access doors. Coordinate installation with work of other trades.

B. Advise installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

C. Install access doors flush with adjacent finish surfaces.

D. Adjust doors and hardware after installation for proper operation.

E. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

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SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

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. Exterior aluminum-framed storefronts.
    a. Glazing is retained mechanically with gaskets on four sides.
2. Exterior manual-swing aluminum doors.
3. Exterior aluminum door frames.

B. Related Sections include the following:

1. Division 7 Section "Building Insulation" for insulation materials field installed with aluminum-framed systems.
2. Division 7 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
3. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
4. Division 8 Section "Glazing" for glazing requirements to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:
    a. Deflection exceeding specified limits.
    b. Thermal stresses transferred to building structure.
    c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
    d. Glazing-to-glazing contact.

e. Noise or vibration created by wind and thermal and structural movements.
f. Loosening or weakening of fasteners, attachments, and other components.
g. Sealant failure.
h. Failure of operating units to function properly.

B. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. Provide sealant that fails cohesively before sealant releases from substrate when tested for adhesive compatibility with each substrate and joint condition required.

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.

C. Structural-Sealant Joints: Designed to produce tensile or shear stress in structural-sealant joints of less than 20 psi .

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity but not less than 10 seconds.

F. Windborne-Debris-Impact-Resistance-Test Performance: Provide aluminum-framed systems that pass large and small missile-impact tests and cyclic-pressure tests.

G. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. 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.

H. Maximum Water Leakage: According to AAMA 501.1.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

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

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
3. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

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

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Welding certificates.

G. Preconstruction Sealant Test Reports: For structural-sealant-glazed systems, compatibility and adhesion test reports from sealant manufacturer indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants. Include sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.

I. Structural-Sealant-Glazing Quality-Control Program: Developed specifically for Project.

J. Structural-Sealant-Glazing Quality-Control Program Reports: Documenting quality-control procedures and verifying results for aluminum-framed systems.

K. Field quality-control test and inspection reports.

L. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

M. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

a. Include structural-sealant-glazing quality-control program development and reporting complying with ASTM C 1401 recommendations including, but not limited to, system material qualification procedures, preconstruction sealant-testing program, and procedures and intervals for system fabrication and installation reviews and checks.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Preconstruction Sealant Testing: For structural-sealant-glazed systems, perform sealant manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by aluminum-framed systems.

1. Test a minimum of five samples of each metal, glazing, and other material.
2. Prepare samples using techniques and primers required for installed systems.
3. For materials that fail tests, determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

E. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

F. Structural-Sealant Glazing: Comply with recommendations in ASTM C 1401, "Guide for Structural Sealant Glazing."

G. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

1.6 PROJECT CONDITIONS

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

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage through fixed glazing and framing areas.
f. Failure of operating components to function properly.

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

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

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

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. Vistawall Architectural Products.
2. Wausua.
3. Kawneer.

2.2 MATERIALS

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

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard 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.

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.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: High-performance plastic connectors separate framing members exposed to the exterior from members exposed to the interior.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.

D. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

E. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

1. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible with structural sealant and other system components with which it comes in contact; and recommended by structural- and weatherseal-sealant and aluminum-framed system manufacturers for this use.

a. Color: Matching structural sealant.

2.5 DOORS

A. Doors: Manufacturer's standard glazed doors, for manual swing operation.

1. Door Construction: 1-3/4-inch. overall thickness with aluminum rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Narrow stile; 2-1/8-inch nominal width.

a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

B. Door Hardware: As specified in Division 8 Section "Door Hardware."

2.6 DOOR HARDWARE

A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.

1. Opening-Force Requirements:

a. Egress Doors: Not more than 30 lbf required to set door in motion and not more than 15 lbf required to open door to minimum required width.
b. Accessible Interior Doors: Not more than 5 lbf .

B. Scheduled Door Hardware: Provide door hardware according to the Door Hardware Schedule.

C. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

2.7 ACCESSORY MATERIALS

A. Insulating Materials: As specified in Division 7 Section "Building Insulation."

B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."

C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form 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. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. 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 (dutchman) to retain glazing in place while structural sealant cures.

F. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

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

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Color: Clear

C. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 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.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing as specified in Division 8 Section "Glazing."

1. Structural-Sealant Glazing:

a. Prepare surfaces that will contact 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.
b. 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.

G. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install insulation materials as specified in Division 7 Section "Building Insulation."

I. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

J. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch .

3.3 FIELD QUALITY CONTROL

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

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.

a. Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C 1401, Appendix X2 shall be used.

1) A minimum of two areas on each building face shall be tested.
2) Repair installation areas damaged by testing.

2. Structural-Sealant Glazing Inspection: After installation of aluminum-framed systems is complete, structural-sealant glazing shall be inspected and evaluated according to ASTM C 1401 recommendations.
3. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under Part 1 "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. .
4. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under Part 1 "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft. and shall not evidence water penetration.
5. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

END OF SECTION 084113

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SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fixed windows.

B. See Division 8 Section "Glazing" for glazing requirements for aluminum windows, including those specified to be factory glazed.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of minimum test size required by AAMA/NWWDA 101/I.S.2.

B. Structural Performance: Provide aluminum windows capable of withstanding the following, including wind loads based on passing AAMA/NWWDA 101/I.S.2, Uniform Load Structural Test, at basic wind speed indicated:

1. Deflection: Based on passing AAMA/NWWDA 101/I.S.2, Uniform Load Deflection Test or on glass framing system designed to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on structural computations.
2. Specified Design Wind Loads: According to ASCE 7.

C. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/NWWDA 101/I.S.2, Air Infiltration Test.
1. Maximum Rate: 0.3 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft.

D. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated when tested according to AAMA/NWWDA 101/I.S.2, Water Resistance Test.
1. Test Pressure: 20 percent of positive design pressure, but not more than 12 lbf/sq. ft.

E. Forced-Entry Resistance: Comply with Performance Level 10 requirements when tested according to ASTM F 588.

F. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45, where windows are indicated to be "thermally improved."

G. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum that meets the local energy code at 15-mph exterior wind velocity and winter condition temperatures when tested according to ASTM E 1423

H. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.

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

I. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/NWWDA 101/I.S.2.

J. Specific Product Performance Requirements: Comply with Section 2.2 of AAMA/NWWDA 101/I.S.2 as applicable to types of aluminum windows indicated.

1.3 SUBMITTALS

A. Product Data: For each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, and operational clearances.

1. Include structural analysis data indicating structural test pressures and design pressures from basic wind speeds indicated and deflection limitations of glass framing systems, signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples: For each exposed finish.

D. Qualification Data: For Installer.

E. Field quality-control test reports.

F. Product test reports.

G. Maintenance data.

H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer: A qualified installer, approved by manufacturer to install manufacturer's products.

B. Fenestration Standard: Comply with AAMA/NWWDA 101/I.S.2, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

C. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.

D. Mockups: Build mockups to demonstrate aesthetic effects, to set quality standards for materials, fabrication, and workmanship, and as a standard for judging acceptability of aluminum window Work.

1. Build mockups as shown on Drawings
2. Perform tests specified in "Field Quality Control" Article. Modify mockup construction and perform additional tests as required to achieve specified minimum acceptable results.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

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1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials and workmanship within two years from date of Substantial Completion.

B. Warranty Period for Metal Finishes: 15 years from date of Substantial Completion.

C. Warranty Period for Glass: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Vistawall / FG-3000 Series
2. Wausau / 4750/6250 RX Series
3. Or approved equal

2.2 GLAZING

A. Glass: Clear, low E insulating-glass units complying with Division 8 Section "Glazing."

B. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

2.3 FABRICATION

A. General: Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed AAMA/NWWDA 101/I.S.2 performance requirements for the following window type and performance class. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

F. Mullions: Provide mullions and cover plates as shown, matching window units, complete with reinforcing and anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates, reinforcing, and anchors capable of withstanding design loads of window units.

G. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

H. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

I. Concealed Joint Sealants: For sealants concealed within the windows and for window system component-to-component sealants provide manufacturers standard sealant with capability to meet performance requirements.

2.4 FINISHES

A. Aluminum High-Performance Organic Finish: Two-coat thermocured system with fluoropolymer coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

1. Color: As selected from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

B. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101/I.S.2.

E. Adjust operating sashes and ventilators, screens, and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

F. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

G. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

H. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

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

3.2 FIELD QUALITY CONTROL 382

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

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502, Test Method A, by applying same test pressures required to determine compliance with AAMA/NWWDA 101/I.S.2 in Part 1 "Performance Requirements" Article.
2. Testing Extent: Three windows as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.
3. Test Reports: Shall be prepared according to AAMA 502.

C. Remove and replace windows where test results indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 085113

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SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes door hardware.

1.2 SUBMITTALS

A. Product Data: Submit product data including installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Door Hardware Schedule: Submit door hardware schedule prepared by or under the supervision of door hardware supplier. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware. The Architect's review of schedule shall neither be construed as a complete check nor shall it relieve the Contractor of responsibility for errors, deviations, or omissions from the specified requirements to provide complete door hardware for the project.

1. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

2. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware. Supply templates to door and frame manufacturer(s) to enable proper and accurate sizing and locations of cutouts for hardware. Detail any conditions requiring custom extended lip strikes, or any other special or custom conditions.
   g. Door and frame sizes and materials.

C. Keying Schedule: Submit keying schedule prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware 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. Supplier Qualifications: Door hardware supplier, who has completed a minimum of three (3) projects over the last 5 years which were similar in material, design and extent to that indicated

for the project and which have resulted in construction with a record of successful in service performance, and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

D. Regulatory Requirements: Comply with the following:

1. Provide hardware items complying with the applicable provisions for accessibility and usability by the disabled and handicapped in compliance with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, and the local building code, whichever is more stringent.
2. NFPA 101: Comply with applicable provisions for means of egress doors.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section, and the Door Hardware Schedule indicated on the drawings.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.
2. The hardware supplier shall review each hardware set and compare it with the door types, details, and sizes as shown and verify each hardware item for function, hand, backset, and method of fastening through shop drawing submittals.

2.2 HINGES AND PIVOTS

A. Butt Hinge Products and Manufacturers:

1. Standard Weight, Ball Bearing, 5 Knuckle, Steel: Complying with BHMA A156.1 A8112, one of the following:
   a. BB1279; Hager Companies (HAG).
   b. TA2714; McKinney Products Company (MCK).

2. Heavy Weight, Ball Bearing, 5 Knuckle, Steel: Complying with BHMA A156.1 A8111, one of the following:
   a. BB1168; Hager Companies (HAG).
   b. T4A3786; McKinney Products Company (MCK).

3. Heavy Weight, Ball Bearing, 5 Knuckle, Stainless Steel: Complying with BHMA A156.1 A5111, one of the following:
   a. BB1199; Hager Companies (HAG).
   b. T4A3386-32D; McKinney Products Company (MCK).

B. Pivot and Pivot Hinge Products and Manufacturers:

1. Offset Pivots:

   a. Offset Pivot with Jamb Mounted Bottom Pivot: Mortised mounted, handed, 3/4 inch (19 mm) offset pivot set and composed of a head mounted top pivot and jamb mounted bottom pivot. Furnish with extended spindles. Complying with BHMA A156.4 C07131.

      1) Model 195 Offset Hung Pivot Set; Rixson-Firemark, Inc. (RIX).
      2) 7215 Pivot Set; Ives: H. B. Ives (IVS).
      3) 0195 Offset Pivot Set; Architectural Builders Hardware Mfg., Inc. (ABH).

   b. Offset Pivot with Floor Mounted Bottom Pivot: Mortised mounted, handed, 3/4 inch (19 mm) offset pivot set and composed of a head mounted top pivot and floor mounted bottom pivot. Furnish with extended spindles. Complying with BHMA A156.4 C07162.

      1) Model 117 Offset Hung Pivot Set; Rixson-Firemark, Inc. (RIX).
      2) 7226 Pivot Set; Ives: H. B. Ives (IVS).
      3) 0117 Offset Pivot Set; Architectural Builders Hardware Mfg., Inc. (ABH).
      4) Model 147 Offset Hung Pivot Set; Rixson-Firemark, Inc. (RIX).
      5) 7226 Pivot Set; Ives: H. B. Ives (IVS).
      6) 0147 Offset Pivot Set; Architectural Builders Hardware Mfg., Inc. (ABH).

   c. ¼" Offset Pivot with Jamb Mounted Top and Bottom Pivots: 327; Stanley Commercial Hardware (STH).

2. Center Pivots: Mortised mounted, non-handed, center pivot set and composed of a head mounted top pivot and floor mounted bottom pivot. Furnish with extended spindles. Complying with BHMA A156.4 C07032.

   a. Model 370 Center Hung Pivot Set; Rixson-Firemark, Inc. (RIX).
   b. 7255 Pivot Set; Ives: H. B. Ives (IVS).
   c. 0370 Center Hung Pivot Set; Architectural Builders Hardware Mfg., Inc. (ABH).
   d. Model 370 Center Hung Pivot less standard top pivot x 345 Top Pivot; Rixson-Firemark, Inc. (RIX).

3. Intermediate Pivots: Mortised jamb mounted, non-load bearing, handed, 3/4 inch (19 mm) offset intermediate pivots. Complying with BHMA A156.4 C07321.

   a. Model M19 x ¾ Intermediate Offset Pivots; Rixson-Firemark, Inc. (RIX).
   b. 7200 INT Series Pivots; Ives: H. B. Ives (IVS).
   c. 019 Intermediate Pivot; Architectural Builders Hardware Mfg., Inc. (ABH).

C. General Hinge and Pivot Characteristics: Where door jamb or trim projects to such an extent that the width of leaf specified will not allow the door to clear such frame or trim, furnish hinges and pivots with leaves of sufficient width to clear. Hinges and pivots shall be template hinges conforming to BHMA A156.1 and in accordance with door and frame material requirements.

1. Pivot Hinge Special Layouts: At deep reveals where door frame profiles will not permit the use of a standard top pivot (e.g. deep reveals, narrow frames, full height doors) furnish top pivots less top leaf with specially designed and fabricated pivot block.

D. Butt Hinge and Offset Pivot Hinge Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to and including 60 inches (1524 mm).
2. Three Hinges: For doors with heights of greater than 60 inches (1524 mm) to and including 90 inches (2286 mm).
3. Four Hinges: For doors with heights greater than 90 inches (2286 mm) to and including 120 inches (3048 mm).
4. Provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).

E. Butt Hinge Sizes: 4-1/2 inches (114 mm) h. x 4 inches (102 mm) or 4-1/2 inches (114 mm) w. for doors up to and including 36 inches (914 mm) in width; 5 inches (127 mm) h. x 4 inches (102 mm) or 4-1/2 inches (114 mm) w. for doors greater than 36 inches (914 mm) in width.

F. Hinge Characteristics: Full mortise type with square corners. All butt hinges are to have non-rising pins. All butt hinges shall be furnished with button tips.

G. Fasteners: Package all hinges and pivots with machine and wood screws as required by door and frame construction.

2.3 LOCKS AND LATCHES

A. Bored Lock and Latch Sets: Extra heavy duty, commercial, cylindrical bodies complying with BHMA A156.2 Series 4000, Grade 1. All lock and latch sets, to be furnished complete with heavy gage steel zinc dichromate coated cylindrical bodies, trim, 2-1/4 inches (57 mm) by 1-1/8 inches (28.6 mm) beveled square cornered fronts, and 6 pin tumbler key in lever core. Provide wrought steel, aluminum, or black plastic, box strikes for each lock and latch set with curved lips of sufficient length to protect frames. Provide plated cast zinc levers with plated wrought brass or bronze roses.

B. Mortise Lock and Latch Sets: Heavy duty, commercial, mortise bodies complying with BHMA A156.13 Series 1000, Grade 1, with throughbolted lever trim. All lock and latch sets, to be furnished complete with heavy gage wrought steel zinc dichromate or chrome plated case, trim, adjustable beveled square cornered armored fronts, steel or stainless steel hubs, and 6 pin cylinders. Provide wrought, or black plastic, box strikes for each lock and latch set with curved lips of sufficient length to protect frames. Provide solid forged or cast levers with wrought roses.

2.4 CYLINDERS AND KEYING

A. Cores for Bored Cylindrical Locksets: Provide key-in lever 6 pin cores for all bored cylindrical locksets, keyed into base building system, as manufactured by the bored lockset manufacturer.

B. Cylinders: Full faced cylinders with square shouldered (not tapered) compression rings, 6 pin cylinders, standard threaded, keyed into building system, with cams to suit lock functions. Provide cylinders for installation into all locks.

C. Keying System: Final keying to determine lock cylinders, keyed alike sets, level of keying, master key groups, grandmaster keying system shall be as directed by the Owner. Supplier

and Contractor shall meet with the Owner and obtain final instructions in writing. Provide 2 nickel silver keys for each lock, and 6 keys for each grandmaster and masterkey system. Provide 2 blank keys for each lock for the Owner's convenience in making additional keys.

1. Temporary Cylinders: Provide temporary cylinders in locks during construction and as may be necessary for security or as may be requested by the Owner. All temporary cylinders shall be individually keyed as required and subject to a single master key.

D. Key Control System: Furnish a key control system with complete accessories including key gathering envelopes, labels, reserve pattern key tags with self-locking key clips, key receipt forms, key receipt holders, 3 way visible card index, temporary key markers and permanent key markers.

2.5 STRIKES

A. Strikes for Locks and Latches: All strikes for locks and latches shall be provided by the lock and latch manufacturer unless otherwise specified or scheduled, refer to Article 'Locks and Latches'.

B. Dustproof Floor Strikes: Complying with BHMA A156.16, Type L04251 or L14021, one of the following:
1. DP2; H.B. Ives.
2. 570 x 571; Rockwood Manufacturing Company (RM).

2.6 OPERATING TRIM (PUSHES AND PULLS)

A. Type 1: Fabricate push pulls for back to back mounting from 1-1/2 inch (38-mm) diameter stainless steel bar stock in finish as scheduled. Custom fabricate push pulls to length indicated with minimum 2-11/16 inch (68-mm) projection, minimum 1-1/2 inch (38-mm) clearance with bases centered. Furnish spacers threaded to accept concealed throughbolt attachment including provision for spanner tightening of bolts of assembly. Do not provide baseplates at stile to pull interface.

2.7 CLOSERS

A. Surface-Mounted Closers: Closers shall meet BHMA A156.4, Grade 1. Properly detail closers to meet application requirements by providing drop plates, brackets, etc. to meet application and installation requirements as indicated. Comply with manufacturers recommendations for size of door closer depending on size of door, stack pressure conditions, and anticipated frequency of use. Arm finish to match closer cover finish scheduled. Provide metal covers of clean line design with plated or primed for paint finish as scheduled and that require removal in order to make adjustments to closer.

B. Overhead Concealed Closers, Butt and Offset Hung: Closers shall meet BHMA A156.4, Grade 1. Properly detail closers to meet application and installation requirements as indicated. Comply with manufacturers recommendations for size of door closer depending on size of door, stack pressure conditions, and anticipated frequency of use. Provide manufacturers standard cover plate finished to match exposed portions of butts or pivots provided.

C. Overhead Concealed Closers, Center Hung: Closers shall meet BHMA A156.4, Grade 1. Properly detail closers to meet application and installation requirements as indicated. Comply with manufacturers recommendations for size of door closer depending on size of door, stack

pressure conditions, and anticipated frequency of use. Provide manufacturers standard cover plate finished to match exposed portions of butts or pivots provided. Provide with manufacturers standard top arm and pivot to suit conditions indicated.

2.8 PROTECTIVE TRIM UNITS

A. Kick Plates: Fabricate protection plates from minimum 0.050 inch (1.3 mm) thick stainless steel, beveled top and 2 sides (B3E), square corners, complying with BHMA A156.6, and fastened with oval head Phillips fasteners countersunk into plate surface.

B. Size: Furnish kick and armor plates sized 2 inches (51 mm) less than door width. Furnish kickplates in 12 inches (305 mm) heights unless otherwise indicated. Provide protective plates with cutouts for locks, louvers and windows to the extent indicated. Mount protective plates flush with bottom of door.

2.9 STOPS AND HOLDERS

A. Angle Stops: Special angle stop, fabricated from brass or bronze, for single or pairs of doors without stops and having a minimum of 2 rubber silencers per stop, minimum 2 inches (51 mm) wide x 3 inches (76 mm) long base for mortising into the head of door frame, 1 inch (25 mm) maximum stop face projection; finish as scheduled.

B. Floor Stops: Cast half-dome design with rubber bumper, finish as scheduled. Provide manufacturer's standard riser heights as required for carpeted areas in conjunction with the floor bumpers scheduled.

C. Silencers for Metal Door Frames: BHMA A156.16, Type L03011; grey rubber. Provide 2 silencers for each pair of doors, 3 silencers for each single door.

D. Wall Stops: Cast disc type with concave rubber bumper, having a 2-1/2 inch (63.5 mm) diameter base with nominal 1 inch (25 mm) projection and concealed attachment to substrate.

1. For Attachment to Gypsum Wallboard: Complying with BHMA A156.16, Type L12251 or L12101.

2.10 FABRICATION

A. Manufacturer's Nameplate: Provide each door hardware item without exposed manufacturers labels, names, or designs.

B. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips oval-head screws with finished heads to match surface of door hardware item being attached. Machine screws and expansion shields shall be used for attaching hardware to concrete and masonry. Use throughbolts for renovation work only where existing door blocking and reinforcements are unknown.

1. Concealed Fasteners: All new doors and door frames have been specified with adequate blocking and reinforcement provisions to eliminate exposed throughbolting of hardware items. Doors installed with exposed throughbolts will be rejected and replaced by the

Contractor at no cost to the Owner. Where through bolts are used on existing doors provide sleeves for each through bolt.

2.11 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Appearance of Finished Work: Finishes of the same designation, that come from 2 or more sources, shall match when the items are viewed at arms length and approximately 2' apart. Unless otherwise scheduled, match each hardware item in a single hardware set with the scheduled latch or lock set finish. Painting of BHMA 600 (USP) surfaces is required and is specified under Division 9 Section 'Painting':

C. Designations: The abbreviations used to schedule hardware finishes are generally BHMA (Federal Standards where indicated in parenthesis) designations. Comply with base material and finish requirements indicated by the following:

1. BHMA 600 (USP): Primed for painting.
2. BHMA 605 (US3): Bright brass, clear coated.
3. BHMA 619 (US15): Satin nickel plated, clear coated.
4. BHMA 626 (US26D): Satin chromium plated.
5. BHMA 628 (US28): Satin aluminum, clear anodized.
6. BHMA 630 (US32D): Satin stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install hardware in accordance DHI A115 (for steel doors and frames, DHI A115-W series for wood doors, and hardware manufacturers installation instructions for doors and frames fabricated from other than steel or wood.

3.2 INSTALLATION

A. Mounting Heights: Mount door hardware units at the following heights, unless specifically indicated on the drawings or required to comply with governing regulations:

1. Locks and Latches: 38 inches (956 mm) to center of lever from finish floor.
2. Door Pulls: 44 inches (1118 mm) from finish floor to center of grip. Pull bases centered on door stiles, unless otherwise indicated.
3. Push Plates: 44 inches (1118 mm) from finish floor to center of plate. Coordinate with pull location.
4. Butt Hinges: 10 inches (254 mm) to bottom of lowest hinge from finish floor; 5 inches (127 mm) to top of upper hinge from top of door; space intermediate hinges equally between lower and upper hinges.
5. Deadbolts: Not more than 44 inches (1118 mm) from finish floor to operating trim.
6. Flush Bolt Operating Mechanisms: Top bolt 66 to 72 inches (1676 to 1829 mm) from finish floor, bottom bolt 12 inches (305 mm) from finish floor.

B. Install each door hardware item to comply with manufacturer's written instructions. Install overhead surface closers for maximum degree of opening obtainable. Place on room side of corridor doors, stair side of stair doors, secondary corridor side of doors between corridors. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be finished, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Do not install permanent key cylinders in locks until the time of preliminary acceptance by the Owner. At the time of preliminary acceptance, and in the presence of the Owner's representative, permanent key all lock cylinders. Record and file all keys in the key control system, and turn system over to Owner for sole possession and control.

D. Key control storage system shall be installed where directed by the Owner.

3.3 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every hardware component. Replace hardware components that cannot be adjusted to operate as intended. Adjust door control devices to compensate for building stack pressures and final operation of forced air mechanical equipment and to comply with referenced accessibility requirements.

3.4 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation. Clean hardware components as necessary to restore proper finish. Provide protection during the progress of the work and maintain conditions that ensure door hardware is in perfect working order and without damage or deterioration at time of Substantial Completion.

3.5 DOOR HARDWARE SCHEDULE – SCHEDULED DOORS

A. As indicated on the drawings.

END OF SECTION 087100

SECTION 087160 - POWER DOOR OPERATORS

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 power door operators for sliding doors.

1. This specification details the requirements for the fabrication and installation of automatic sliding doors. Door packages shall be complete including sliding door(s), sidelite(s) *[filler tube(s) on surface mounted units]*, side jambs, header with roller track, operator, bottom door guides, and activation devices. (Optional transom would also be included with this package).

2. Security system components may be incorporated into the door and frame openings indicated to receive power door operators at the Owner's option. Cooperate with the Owner's security system contractors if the Owner chooses to incorporate security system components during the course of the Work.
   a. Related Work:
      1. Preparation of the plumb and square masonry opening.
      2. Floor preparation.
      3. Electrical supply and connection (dedicated 120 VAC, 15 amp circuit to each operator/header).

1.3 DEFINITIONS

A. Activation Device: A device that, when actuated, sends a signal to an automatic door operator to open a door.

B. Safety Device: Device that prevents a door from opening or closing.

1.4 SUBMITTALS

A. Product Data: Submit product data for each door operator type required. Include manufacturer's standard details, material descriptions, dimensions of individual components and profiles, certified performance reports, installation instructions, and parts lists.

B. Shop Drawings: Submit shop drawings showing fabrication and installation details for automatic door operators. Include locations and elevations of door openings indicating activation and safety devices.

1. Wiring Diagrams: Detail wiring for power operator, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Samples: Submit 3" square samples for each exposed finish required.

D. Reports: Submit field adjustment test reports.

E. Maintenance Data: Submit maintenance, emergency, and operation data for power door operators.

F. Warranties: Submit specified warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage a factory trained installer, with a minimum of 3 years successful experience in the installation of power door operators and, who is an authorized representative of the product manufacturer for both installation and maintenance of power door operators required for this Project.

B. Source Limitations: Obtain automatic door operators through one source from a single manufacturer.

C. BHMA Standard: Provide and install power door operators that comply with applicable requirements of BHMA A156.19, "Power Assist and Low Energy Power Operated Doors."

D. UL Standard: Provide power door operators that comply with UL 325. All electrical components, devices, and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authorities having jurisdiction, and marked for intended use.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of supporting structure by field measurements before fabrication so that the power door operator work will be accurately fabricated and fitted to the structure. Indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Use Contractor's lines and benchmarks as a basis for measurements.

1.7 COORDINATION

A. Templates: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing power door operators. Check shop drawings of adjacent work to confirm that adequate provisions are made for locating and installing power door operators to comply with indicated requirements.

B. Electrical System Roughing In: Coordinate layout and installation of power door operators with connections to power supplies and security access control systems (if any).

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace components of the power door operator system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Faulty or sporadic operation of operator or activation and safety devices.

2. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.

C. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

1. Series 1100 Ultra-Glide sliding door packages as detailed shall be supplied by ***KM SYSTEMS, INC.***, Monroe, NC.

2.2 GENERAL DOOR OPERATOR REQUIREMENTS

A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

1. Provide door operators with features for field adjustment of opening speed, closing speed, back check, hold open time, opening force, and acceleration during opening and recycling for soft start.
2. Provide door operators with precision machined gear systems, and motors, especially engineered and fabricated by the power door operator manufacturer for the use indicated. Fabricate gear systems and motors complete with sealed bearings, all weather lubricants and fluids, and vibration and noise isolation to provide long term, quiet and smooth service.
3. Provide door operators with microprocessor controls to accommodate site specific security system interface conditions such as required for card reader access, electric strike delay timers, electric strike power functions, electromechanical locks, and electromagnetic locks.
4. Provide door arm assemblies finished to match exposed housing.
5. Provide door operators that comply with NFPA 80 requirements for doors as emergency exits and that do not interfere with fire ratings.

B. DOORS AND FRAMES:

1. All structural aluminum sections shall be 6063-T5 alloy with stainless steel clad surfaces.
2. Extruded aluminum header and cover shall conceal continuous roller track, nylon polymer track cap, and anti-derail extrusion. Track and cap shall be replaceable without replacing or removing header. Door carrier assemblies shall incorporate four steel, precision, sealed ball bearing rollers and Grade 8 alloy steel hanger bolts. Concealed bottom door guides shall provide stable movement of sliding panels.
3. Narrow stile door and sidelite construction shall utilize 1¾" (44 mm) deep x 2" (51 mm) wide vertical profiles and 3½" (89 mm) bottom rails *[medium stile door and sidelite construction shall utilize 1¾" (44 mm) deep x 3½" (89 mm) wide vertical profiles and 6" (152 mm) bottom rails]*. Wool weather pile shall run full height at front of sliding door(s), back of sidelite(s), and between the door(s) and sidelite(s) *[filler tube(s) on surface mounted units]*.

2.3 OPERATOR CONTROLS

A. Wall Push-Plate Switches (Actuators): Flush, satin stainless steel wall-mounted, door-control switch plate for operation by touch. Install a wall push plate actuator on each side of each automatic swinging entrance door.

B. Provide each push button actuator with a decal to be applied adjacent to the actuator instructing the user as to the operation and function of the door.

C. OPERATOR: Door movement shall be driven by a sealed, brushless DC gearmotor and nylon reinforced drive belt. The multifunction microprocessor control shall provide fully adjustable open, close, and check speeds. An adjustable hold open time delay (1-60 seconds) shall be provided. The microprocessor shall provide a safety-first recycle/stop feature if closing/opening is obstructed. The control shall provide self-monitor system that compensates each cycle for changes in temperature, wind load, pressure and mechanical drag and checks for proper internal operation. The control shall adjust motor speeds, checking action, and other operating characteristics. An ON/OFF switch and resettable circuit breaker shall be provided. The system shall be provided with a reduced opening feature that allows a field setting of the reduced opening width. The reduced opening can be constant or as a function of traffic frequency. Selectable ratchet mode shall keep the door in the open position until a second activation signal. After receipt of a second activation signal, the door shall close. The operator shall allow the door to be opened manually in power off conditions. Optional battery pack shall automatically either open or close the door(s) after power is lost.

D. EMERGENCY EGRESS Sliding door(s) and swing-out sidelites (on units so equipped) shall be capable of being swung out to 90° from any position of slide movement (except for SR units) and require no more than 50 lbf. (222 N) of force applied at the lock stile to open. Units with this emergency egress feature comply with Chapter 5, Means of Egress, of the Code for Safety from Fire in Buildings and Structures, ANSI/NFPA 101.

E. SECURITY: The sliding doors shall be fitted with a Maximum Security hookbolt deadlock. Biparting units shall include a threshold bolt for two-point locking. Units with swing-out sidelites shall incorporate mechanical interlocks between the sliding door(s) and sidelite(s) to guard against forced entry when the unit is locked. (Option: Unit can be provided with either a fail-safe or fail-secure electric lock concealed in the header and coordinated with the operator to electrically lock against slide. Additionally, units with swing-out sidelites can be equipped with Adams Rite Series 8600 concealed vertical rod exit devices on the doors to lock against swing. Surface applied units and units with fixed sidelites can be equipped with Jackson Model 1085P paddle-type concealed vertical rod exit devices on the doors to lock against swing, if allowed by local code authorities).

F. FINISH: All exposed surfaces shall be 204-R1 clear anodized or 313-R1 two-step, hard coat dark bronze anodized for Class 1 architectural finish. Other painted or anodized colors as specified.

G. SAFETY AND ACTIVATING DEVICES: Unit shall have two infrared safety beams installed at 24" and 48" from the finished floor. On single slide units, beams will be installed in the vertical stile of the sidelite facing the door opening [in the filler tube on surface mount units] and the lock side jamb. On biparting units, beams will be installed in the vertical stiles of the sidelites [in the filler tubes on surface mount units]. The beams will not be active when the doors are fully closed.

H. Motion sensors shall be installed on both sides of the unit to detect traffic approaching the door from either direction. For units intended for one-way traffic only, the motion sensor on the side not intended for use shall not be active when the doors are fully closed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame supports, and other conditions affecting performance of power door operators. Examine roughing-in for electrical and security services to verify actual locations of connections, and to verify that the proper types of electrical and security services have been provided, before power door operator installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install complete power door operator system according to manufacturer's written instructions and BHMA A156.19, including activation and safety devices, control wiring, and remote power units.

3.3 ADJUSTING

A. Adjust power door operators and activation and safety devices to operate smoothly, easily, and properly, quietly, and for a safe operation and weathertight closure without binding, scraping, and excessive noise. Adjust doors with low energy door operators to function according to BHMA A156.19.

B. Lubricate operators, hardware and other moving parts.

C. Repair damaged exposed component finishes after completing power door operator installation.

END OF SECTION 087160

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SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Glazed entrances.
4. Interior borrowed lites.
5. Storefront framing.

B. Refer to Division 8 Section "Aluminum Entrances and Storefronts", and "All-Glass Entrances and Storefronts" for requirements applicable to single subcontract responsibility for glazing.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide and install glazing systems capable of withstanding impact loads without failure of any kind, including loss or breakage of glass, failure of seal or gaskets, exudation of glazing sealants, and excessive deterioration of glazing materials.

B. Glass Design: Glass thicknesses and heat treatments indicated are minimum requirements. Glazing details shown are for convenience of detailing only and are to be confirmed by the Contractor relative to cited standards and final framing details. Confirm glass thicknesses and heat treatments, as required to meet the performance and testing requirements specified in Division 8 Section, "Aluminum Entrances and Storefronts", and "All-Glass Entrances and Storefronts".

1.3 SUBMITTALS

A. Product Data: Submit product data for each glass product and glazing material indicated.

B. Glass Manufacturers Letter: The glass manufacturer shall submit a letter certifying that he has reviewed the glazing details proposed for the project, including the use of gaskets and sealants, and that each product to be furnished is recommended for the application shown.

C. Samples: Label samples to indicate product, characteristics, and locations in the work. Furnish samples of the following:

1. Except for clear glass, submit samples of each glass type specified, in the form of 12-inch- (300-mm-) square Samples.
2. Submit samples of each glass type specified where production run variations, and defects are expected.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1.4 QUALITY ASSURANCE

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

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

C. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

D. Safety Glass: Comply with the applicable requirements of the laws, codes, ordinances and regulations of Federal and Municipal authorities having jurisdiction, wherever requirements conflict the more stringent shall be required. Obtain approvals from all such authorities. As a minimum provide Category II materials complying with testing requirements in 16 CFR 1201 (Consumer Product Safety Commission "Safety Standard for Architectural Glazing Materials", as published in the Code of Federal Regulations) and ANSI Z97.1.

E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials.

1.6 WARRANTY

A. Manufacturer's Special Warranty on Ceramic Frit Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units whose coatings flake, peel, or crack within the specified warranty period indicated below. Upon notification of such deterioration within the warranty period furnish replacement glass units for those glass units whose coatings have flaked, peeled or cracked at the convenience of the Owner.

1. Warranty Period: 5 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass manufacturer agreeing to furnish replacements for laminated-glass units that develop edge separation, de-lamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard within the specified warranty period indicated below. Upon notification of such deterioration within the warranty period furnish replacement glass units for those glass units having edge separation, de-lamination and blemishes at the convenience of the Owner.

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

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Refer to the finish schedules on the drawings for the extent of glass types and locations. The Contractor shall confirm the levels of heat treatment required for each glass type scheduled as contained in Articles Performance Requirements, Submittals and Quality Assurance.

2.2 PRIMARY FLOAT GLASS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated on the drawings.

2.3 HEAT-TREATED FLOAT GLASS

A. General: Heat treat glass where required to meet safety glazing requirements.

B. Sizes and Cutting: Prior to heat treatment, cut glass to required sizes as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with glass manufacturer's recommendations. Do not cut or treat edges in the field.

C. Fully Tempered Glass: Provide glass complying with ASTM C1048 Kind FT and meeting the requirements of ANSI Z97.1. Surface compression shall be equal to or greater than 10,000 psi (69 MPa).

2.4 GLAZING SEALANTS

A. Gasket, Blocking, and Spacer Wet Glazing Materials: Silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.

B. Butt Glazing Sealants: Refer to Division 7 Section "Joint Sealants", Article 'Elastomeric Joint Sealants', subparagraph 'Butt Glazing Sealant'.

C. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Continuous extruded EPDM with cross sectional profile, physical properties, and tolerances as recommended by the glass manufacturer, and as required, to comply with the performance requirements specified and shown all in compliance with the applicable provisions of ASTM C864, Option II.

2.6 MISCELLANEOUS GLAZING MATERIALS

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

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: EPDM complying with ASTM C864 (Option II), blocks, 85 +/- 5 Shore A durometer hardness, 1/16 inch (1.5-mm) less than the channel width, and length based on the face area the glass unit to be supported in accordance with GANA standards and glass manufacturer recommendations but not less than 4 inches (101.6 mm).

D. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.7 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

1. Edge and Surface Conditions: Comply with the recommendations of AAMA "Structural Properties of Glass" for "clean-cut" edges, except comply with manufacturer's recommendations when they are at variance therewith.

2. Exposed Glass Edges and Surface Condition: All edges shall be flat with an arrissed edge profile (small bevel of uniform width not exceeding 1.5 mm at an angle of approximately 45 degrees to the surface of the glass) with a polished (surface is reflective in appearance similar to the major surface of the glass) surface.

B. Cutting: Do not nip glass edges. Edges may be wheel cut or sawed and seamed at manufacturer's option. For glass to be cut at site, provide glass 2 inches (50.8 mm) larger than required in both dimensions, so as to facilitate cutting of clean cut edges without the necessity of seaming or nipping. Do not cut, seam, nip or abrade heat-treated glass.

C. Etching: Clean glass surfaces of all oil, grease, and any other deleterious substances that might affect the work. Etch glass. Etched areas of glass to appear light white in a density and color as acceptable to the Architect. Seal acid etched glass surfaces with glass sealer (Skyline Etch Sealer; Skyline Design, Chicago, IL).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier and glass framing erector present, for compliance with the following:

1. Compliance with the specified manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Minimum required face or edge clearances.
3. 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 stops, glazing channels, and rabbets which will be in contact with the glazing materials immediately before glazing. Remove coatings which might fail in adhesion or interfere with bond of sealants. .Comply with manufacturers instructions for final wiping of surfaces immediately before application of primers. Wipe metal surfaces with IPA (isopropyl alcohal).

1. Prime surfaces to receive glazing compounds. When priming, comply with wet glazing manufacturers recommendations.

B. Inspect each piece of glass immediately before installation. Do not install any pieces which are improperly sized or have damaged edges, scratches or abrasion or other evidence of damage. Remove labels from glass immediately after installation.

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.

1. All glass units shall be installed in accordance with the glass manufacturers recommendations.

a. Butt Glazed Interior Monolithic Glass Units: Mask the surfaces on both sides of the joints to be glazed. Provide wood dowel, with a diameter of at least 3 times of the joint width, wrapped in polyethylene tape, and firmly taped to interior face of glass unit to be glazed to act as a back-up during glazing operation. Place glazing sealant and tool face of sealant slightly concave using extreme care not to chip or otherwise abrade corners of glass. Allow sealant to fully cure before removing dowel.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to surfaces indicated to receive glazing materials.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless more stringent requirements are recommended by glass manufacturer.

1. For Glass Units Less Than 72 inches (1830 mm): Locate setting blocks at sill one-quarter of the width in from each end of the glass unless otherwise recommended by the glass manufacturer.
2. For Glass Units 72 inches (1830 mm) or Greater: Locate setting blocks at sill one-eighth of the width in from each end of the glass, but not less than 6 inches (150 mm), unless otherwise recommended by the glass manufacturer.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Set glass lites with uniform pattern, draw, bow, and similar characteristics, producing the greatest possible degree of uniformity in appearance on the entire wall elevation.

1. Set glass units with void between edge of units and glazing channel.

H. Where wedge-shaped gaskets are driven into one side of channel to pressurize gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

I. Miter cut gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away.

3.4 PROTECTION AND CLEANING

A. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way and from any source, including natural causes, accidents, and vandalism.

B. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 088000

SECTION 092400 - PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Metal lathing work to receive mortar and masonry veneer. Mortar and masonry veneer materials and their installation are specified under Section 04 73 00, MANUFACTURED STONE VENEER.

2. Metal lathing and Portland cement plaster (stucco) work for the Drive Thru soffit areas.

1.2 SUBMITTALS

A. Samples: Submit samples at least 12 inches (300 mm) square of each type of finish indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain plaster materials from a single manufacturer to ensure consistency in quality of performance and appearance.

B. Machine applied plaster work shall be performed by a firm having 3 years experience in the machine application of plaster on projects similar to this Project.

C. Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following, where standards conflict the more stringent shall apply:

1. American Society for Testing and Materials (ASTM):

a. ASTM C 1063 "Installation of Lathing and Furring for Portland Cement Based Plaster."

b. ASTM C 926 "Application of Portland Cement Based Plaster."

2. "Portland Cement Plaster (Stucco) Manual" published by the Portland Cement Association.

D. Mockups: Prior to installing plaster work, construct panels for each type of finish and application required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.

2. Erect mockups 48 by 48 inches (1200 by 1200 mm) by full thickness using materials, including lath, support system, and control joints, indicated for final Work.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Architect's acceptance of mock-ups will be for color and texture only. Obtain acceptance of mockups before start of plaster Work.

5. Remove unsatisfactory work as directed at no cost to the Owner.

6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed portland cement plaster Work.

   a. When directed, remove mockups from Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver cementitious materials to Project site in original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number.

B. Store materials inside, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.

1.5 PROJECT CONDITIONS

A. Environmental Requirements, General: Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after plaster application.

   1. At all times during application and for a period of not less than 48 hours after application of each coat, provisions shall be made to keep plaster work above 40 deg. F. (4 degrees C).

B. Cold-Weather Requirements: Provide heat and protection, temporary or permanent, as required to protect each coat of plaster from freezing for at least 24 hours after set has occurred. Distribute heat uniformly to prevent concentration of heat on plaster near heat sources; provide deflection or protective screens.

   1. Do not apply plaster when ambient temperature is below 40 deg F (4 deg C).

   2. Do not apply plaster to frozen scratch and brown coats or to scratch or brown coats containing frost. Plaster mixes shall not contain frozen ingredients.

C. Warm-Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

D. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

PART 2 - PRODUCTS

2.1 LATH

A. Expanded-Metal Lath: Comply with ASTM C 847 and the following:

1. Material: Fabricate expanded-metal lath from structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653, G60 (ASTM A 653M, Z180) minimum coating designation. Provide dimpled indentations to hold lath a minimum of 1/4" from exterior face of gypsum sheathing.

2. Diamond-Mesh Lath: Unbacked, self-furring weighing 3.4 lb/sq. yd. (1.8 kg/sq. m).

B. Lath Attachment Devices: Hot dipped galvanized coated devices of material and type required by referenced standards and recommended by lath manufacturer for secure attachment of lath to exterior face of gypsum sheathing and of lath to lath.

2.2 ACCESSORIES

A. General: Unless otherwise specified, comply with material provisions of ASTM C 1063; coordinate depth of accessories with thicknesses and number of plaster coats required. Where required to be galvanized fabricate from zinc-coated (galvanized) steel sheet complying with ASTM A 653, G40 (ASTM A 653M, Z90) minimum coating designation. Where required to be fabricated from zinc alloy comply with ASTM B 69, and composed of 99 percent pure zinc.

B. Metal Corner Reinforcement: Diamond mesh, expanded metal lath manufactured from zinc-coated (galvanized) carbon steel sheet weighing not less than 1.75 lb/yd^2. Specially formed to reinforce external corners of portland cement plaster on exterior exposures while allowing full plaster encasement.

C. Cornerbeads: Small nose cornerbeads fabricated from zinc alloy, minimum 0.0207 inch (0.53 mm) thick, with minimum 2-7/8" wide expanded flanges of large-mesh diamond-metal lath allowing full plaster encasement.

D. Casing Beads: Square-edged style, with minimum 3-1/8" expanded flanges fabricated from zinc alloy and having a minimum 0.0207 inch (0.53 mm) thickness.

E. Strip Lath Reinforcement: Minimum 6" wide, flat, diamond mesh, expanded metal lath manufactured from zinc-coated (galvanized) carbon steel sheet weighing not less than 1.75 lb/yd^2.

F. Control Joints:

1. Vertical Joints: Prefabricated one piece folded pair of minimum 0.018 inch (0.46 mm) thick zinc alloy nonperforated screeds in M-shaped configuration, with expanded or perforated minimum 3/4" wide flanges and a minimum 1/4" wide joint for expansion. Provide with removable plastic tape for temporary joint slot protection.

2. Horizontal Joints:

a. Wide Channel Screed (SA-1): Fry Reglet Corp. PCS-75-250, fabricated from clear anodized extruded aluminum.

b. Narrow Channel Screed (SA-2): Fry Reglet Corp. PCS-75-50, fabricated from clear anodized extruded aluminum.

c. Modified Channel Screed (SA-3): Fry Reglet Corp. Factory modified PCS-75-250 to make FPM-75-250, fabricated from clear anodized extruded aluminum.

G. Lath Attachment Devices: Material and type required by ASTM C 1063 for installations indicated.

2.3 PLASTER MATERIALS

A. Base-Coat Cements: Portland cement, ASTM C 150, Type I or Type II, grey.

B. Finish Coat Materials: Manufacturer's standard factory-packaged products specifically formulated for application to Portland cement lime stucco basecoats.

1. Brown Coat Primer: VOC compliant, 100% acrylic based primer with titanium dioxide pigment base tinted to the color of the selected finish coat and which is formulated to, reduce the potential for efflorescence, enhance the appearance and uniformity of the finish coat, be water permeable, and increase the yield of finish coverage.

a. Product and Manufacturer: Parex Primer 310; Parex, Inc.

2. Finish Coat (ST-): VOC compliant, 100% acrylic polymer textured finish with pure, rust free, crushed marble aggregates, high quality titanium dioxide pigments and custom colored tints to match Architect's samples. The finish coat shall be formulated to have surface hardening properties which do not soften under exterior ambient and surface temperatures caused by the sun providing a non-tacky surface with high resistance to the accumulation of dirt, mold, and air pollutants.

a. Products and Manufacturer: Parex DPR Finish 300 formulated for "Sand Fine Texture" (aggregate size of 1.0 mm) for ST-1 and ST-2 colors and "Sprayed Smooth Texture" (aggregate size of 0.5 mm) for ST-3 color unless otherwise required to match Architect's samples; Parex, Inc.

C. Lime: Special hydrated lime for finishing purposes, ASTM C 206, Type S; or special hydrated lime for masonry purposes, ASTM C 207, Type S.

D. Sand Aggregate for Base Coats: ASTM C 897, Article 'Sand Aggregate for Base Coat'.

E. Scratch Coat Fiber: Alkaline-resistant (AR) glass or polypropylene fibers, complying with ASTM C 1116, 1/2" to 2" long, free of contaminates, manufactured for use in portland cement plaster. Provide the quantity per batch in strict accordance with the published directions of the fiber manufacturer; in no case shall more than 2 lb. of fiber per cubic foot of cementitious material be permitted.

F. Water for Mixing and Finishing Plaster: Drinkable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

G. Asphalt-Saturated Felt: Refer to Section 06105, MISCELLANEOUS CARPENTRY.

H. Steel drill screws used for attaching metal plaster base (lath) shall comply with ASTM C 954 having a 7/16" diameter pan wafer head and a 0.120" diameter shank. Screws used for

attachment to metal framing members shall be self drilling and self tapping and shall be provided in lengths as required to project not less than 3/8" through the metal framing member when lath is installed.

2.4 PLASTER MIXES AND COMPOSITIONS

A. General: Comply with ASTM C 926 for portland cement plaster base and finish coat mixes as applicable to plaster bases, materials, and other requirements indicated.

B. Base-Coat Mixes and Compositions: Proportion materials for respective base coats to comply with the following requirements. Adjust mix proportions below within limits specified to attain workability.

1. Add fiber to following scratch coat mix after ingredients have mixed at least 2 minutes. Reduce aggregate quantities accordingly to maintain workability.

2. Base Coats for Three-Coat Work over Metal Lath:

a. Scratch Coat: 1 part portland cement, 1 part lime, to 4 parts base coat aggregate, fibered.

b. Brown Coat: 1 part portland cement, 1 part lime, 4-1/2 parts base coat aggregate.

C. Factory-Prepared Finish Coats: Add water only; comply with finish coat manufacturer's written instructions.

2.5 MIXING

A. Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

1. Hand mixing will not be permitted.

B. Base coat plasters that have stiffened because of evaporation of water shall be permitted to be tempered one time only to restore required consistency. Plaster not used within 1-1/2 hour from start of initial mixing shall be discarded.

C. Finish coat plasters shall not be tempered.

PART 3 - EXECUTION

3.1 PREPARATIONS FOR PLASTERING

A. Protective Window Screening: Use of protective window screening (e.g. polyethylene, etc.) to keep windows and other penetrations in the stucco field clean of stucco during stucco application will be permitted only if the edges of the protective screening are attached in such a manner that they can be completely removed after stucco placement. Protective screening attachments permanently embedded at window perimeters are strictly prohibited.

3.2 LATHING

A. Standards: Install lathing and plaster accessory materials in accordance with ASTM C 1063, this specification, and the lath and plaster manufacturer, where standards conflict the more stringent shall apply.

1. Strip Lath Reinforcement: At corners of openings exceeding an area of 2 s.f., install strips of metal lath 6" wide x 24" long at a 45 degree angle.

2. Lath Sheets: Lap metal lath at side laps a minimum of 1/2" and at end laps a minimum of 1" and fastened at not more than 6" o.c. to framing members. Where side laps of sheets do not occur at supports, they shall be securely tied together with not less than 18 ga. B.W. Gage (0.049 inch) galvanized annealed steel wire at intervals of not more than 9 inches. Where end laps of sheets do not occur at supports they shall be laced or wire tied together with not less than 18 ga. B.W. Gage (0.049 inch) galvanized annealed steel wire. Stagger ends of adjoining sheets of metal lath.

3. Lath shall be applied with the long dimension at right angles to the supports. Ends of adjoining plaster bases shall be staggered. Lath shall not be continuous through control joints but shall be stopped and tied at each side.

B. Accessories: Provide accessories in single lengths where the length of the accessory does not exceed the manufacturer's standard lengths. Attach accessories securely to plaster bases to hold accessories in place and alignment during plastering. Securely fasten with hardened galvanized screws. Space fastenings not more than 7" apart and staggered.

1. External (Outside) Corners: Install corner reinforcement at external corners and angles. Set beads level, plumb and true to line

2. Internal (Inside) Corners: Provide corner reinforcement at all internal corners.

3. Casing Beads: Install at terminations of plaster work. Miter or cope accessories at corners. Set beads level, plumb and true to line.

4. Control Joints: Install control joints at locations indicated or, if not indicated, at locations complying with the following criteria and approved by the Architect:

a. Miter or cope control joints at corners. Set control joints level, plumb and true to line.

b. Align joints with concealed splice or tie plates.

c. Seal all control joint splice joints, T-intersections between vertical and horizontal beads and the terminal ends of beads which cause control joints to be discontinuous. Use mastic for concealed conditions, use silicone sealant at exposed conditions.

d. Spacing: Areas within control joints shall not exceed 100 sq. ft. The distance between control joints shall not exceed 10'-0" in either direction or a length to width ratio of 2-1/2 to 1. Where plaster panel sizes or dimensions change, extend joints full width or height of plaster membrane.

3.3 PLASTER APPLICATION

A. Plaster Application Standard: Apply plaster materials, composition, and mixes to comply with ASTM C 926.

1. Do not use materials that are frozen, caked, lumpy, dirty, or contaminated by foreign materials. Clean mechanical mixers, mixing boxes and tools after mixing each batch; keep free of plaster from previous mixes. Thoroughly mix plaster with proper amount of water until uniform in color and consistency.

2. Do not use excessive water in mixing and applying plaster materials.

B. Sequencing:

1. Sequence plaster application with installation and protection of other work, including aluminum windows and curtain walls, so that neither will be damaged by installation of other.

2. Apply each plaster coat to an entire soffit panel without interruption to avoid cold joints and abrupt changes in the uniform appearance of succeeding coats.

3. Wet plaster shall abut set plaster at naturally occurring interruptions in the plane of the plaster, such as corners, rustications, openings control joints.

C. Flat Surface Tolerances: Do not deviate more than plus or minus 1/8 inch in 10 feet (3 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed at any location on surface.

D. Plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where plaster is not terminated at metal frames by casing beads, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.

E. Corners: Make internal corners and angles square; finish external corners flush with cornerbeads, square and true with plaster faces.

F. Number of Coats: Apply plaster over metal lath plaster base, in three coats, as follows to result in an overall nominal thickness of 5/8" for horizontal (soffit) planes when measured from the back plane of the self furring metal lath exclusive of lath dimples. Apply plaster by hand or machine application except limit machine application to basecoats.

1. Scratch Coat: Apply scratch coat with sufficient material and pressure to form full keys through and to embed the metal lath, and with sufficient thickness of material over the metal to allow for scoring the surface. As soon as the first (scratch) coat becomes firm, the entire surface shall be cross raked (scored). Vertical surfaces shall be scored horizontally. Nominal thickness of scratch coat shall be 1/4" for horizontal (soffit) planes.

2. Brown Coat: Apply brown coat after scratch coat has set firm and hard using sufficient pressure to ensure tight contact with the scratch coat. Firm and hard shall mean that the scratch coat shall have become sufficiently rigid to support application of the brown coat without damage to the monolithic continuity of the scratch coat or its key. Bring out to screeds, straighten to a true surface, and densify with rod and darby without the use of additional water. Leave rough to receive finish coat. The brown coat shall have no variation greater than ¼" in any direction under a 5 foot straight edge. Nominal thickness of brown coat shall be 1/4" for horizontal (soffit) planes.

3. Finish Coat Priming: Remove surface contaminants such as dust and dirt without damaging the brown coat substrate. Apply only to brown coat surfaces that are sound, clean, dry, and free from any residue which may affect the ability of the primer to bond to the brown coat surface. Apply finish coat primer with a roller, brush or a hopper sprayer gun in a continuous coat of thickness as recommended by the finish coat manufacturer. Allow to dry completely before applying finish coat.

4. Finish Coat: Scratch finish coat in thoroughly and immediately double back to a true even plane completely covering the primed brown coat surface and having a uniform minimum thickness of 1/8". Work from wet unset edges to complete an entire unbroken area in one continuous operation to eliminate joinings. Do not over trowel as this may cause color to concentrate on the surface. Float sand fine texture to bring aggregate to surface to produce a finish of uniform fine grained texture free of slick spots, cat faces, and other blemishes. Do not use water in floating or texturing. The finish coat shall match the Architect's accepted sample installation for textures and colors.

G. Curing: Moist-cure portland cement plaster to comply with ASTM C 926, including guidelines for time between coats and curing in "Appendix X1.4.2 General Information", the building code in effect for the project site, and project specific climatological conditions. In general, the model building codes require that the first (scratch) coat have a minimum of 48 hours of moist curing with a minimum interval between coats of 48 hours. The second (brown) coat is required to have a minimum of 48 hours of moist curing with a minimum interval between coats of 7 days. Curing for the finish coat shall be as recommended by the finish coat manufacturer.

1. Climatological conditions such as temperature, relative humidity, sun exposure, and wind shall be considered when determining the length of cure time and the time between coats in conjunction with a technical representative of the Portland cement plaster material manufacturer. Tarping the scaffold should be considered where reduction of sun and wind exposure is desirable.

H. Remove plastic tape at control joint slots.

3.4 CUTTING AND PATCHING

A. Cut, patch, replace, repair, and point up plaster as necessary to accommodate other work. Repair cracks and indented surfaces. Point-up finish plaster surfaces around items that are built into or penetrate plaster surfaces. Repair or replace work to eliminate blisters, buckles, excessive crazing and check cracking, dry outs, efflorescence, sweat outs, excessive pinholes, and similar defects and where bond to the substrate has failed. Repair or replace work as necessary to comply with required visual effects.

B. Sand smooth-troweled finishes lightly to remove trowel marks and arrises.

3.5 CLEANING AND PROTECTING

A. Remove temporary covering and other provisions made to minimize spattering of plaster on other work. Promptly remove plaster from aluminum windows and curtain walls, and other surfaces not to be plastered. Repair surfaces stained, marred or otherwise damaged during plastering work. When plastering work is completed, remove unused materials, containers, equipment, and plaster debris.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure plaster work is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 092400

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SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes gypsum board assemblies.

1.2 ASSEMBLY PERFORMANCE REQUIREMENTS

A. Gypsum board assembly deflections:

1. Typical Walls: Wall assemblies shall be constructed for deflection not to exceed 1/240 of the wall height when subjected to a positive and negative pressure of 5 psf.

2. Walls with Tile Finish: Wall assemblies to receive tile finishes shall be constructed for deflection not to exceed 1/360 of the wall height when subjected to a positive and negative pressure of 5 psf.

3. Ceilings, bulkheads, soffits, ceiling transitions, ledges, and coves shall be constructed for a deflection not to exceed 1/360 of the distance between supports.

1.3 SUBMITTALS

A. Product Data: Submit product data for each product indicated.

B. Samples: Submit full size samples in 12-inch- (300-mm-) long lengths for each exposed trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory."

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

C. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."

D. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

E. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

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

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.6 PRE-INSTALLATION MEETING

A. Prior to start of each type of gypsum wallboard system, and at the Contractors direction, meet at the site and review the installation procedures and coordination with other work. Meeting shall include Contractor, Architect and major material manufacturer as well as the Installer and other subcontractors whose work must be coordinated with the gypsum wallboard work.

1.7 PROJECT CONDITIONS

A. Comply with ASTM C840 requirements or wallboard material manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. General: For fire rated assemblies, provide materials, including accessories and fasteners produced by one manufacturer, or, when products of more than one manufacturer are used in a rated system, they shall be acceptable to authorities having jurisdiction.

2.2 STEEL SUSPENDED CEILING FRAMING

A. Components, General: Provide steel framing members sized and spaced as indicated but not less than that required to comply with ASTM C 754 under the maximum deflection conditions specified under Article 'Assembly Performance Requirements'.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

C. Hanger Attachments to Overhead Decks: Suitable for application indicated, fabricated from corrosion-resistant materials, with eyepins, clips or other devices for attaching hangers and capable of sustaining, without failure, a load equal to 10 times that imposed by the complete ceiling system.

D. Hangers: As follows:

1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.

2. Rod Hangers: ASTM A 510 (ASTM A 510M), mild carbon steel.

a. Diameter: 1/4-inch (6.34-mm).
b. Protective Coating: ASTM A 153/A 153M, hot-dip galvanized.

3. Flat Hangers: Commercial-steel sheet, ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized.

a. Size: 1 by 3/16 inch (25.4 by 4.76 mm) by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch (1.37 mm), a minimum 1/2-inch- (12.7-mm-) wide flange, with manufacturer's standard corrosion-resistant zinc coating.

F. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.

1. Cold Rolled Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, 3/4 inch (19.1 mm) deep.

2. Steel Studs: ASTM C 645, 0.0312 inch (0.79 mm) minimum base metal thickness and minimum depth as required to suit deflection criteria.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.

a. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).

4. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep members designed to reduce sound transmission.

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

2.3 STEEL PARTITION AND SOFFIT FRAMING

A. General: Provide steel framing members sized and spaced as indicated but not less than that required to comply with ASTM C 754 under the maximum deflection conditions specified under Article 'Assembly Performance Requirements'.

1. In areas where top of partitions are dependent on ceiling system for lateral support, coordinate design and installation to comply with the above deflection limitation.
2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.

B. Steel Studs and Runners: ASTM C 645, in minimum depth indicated in partition type details.

a. Minimum Base Metal Thickness:

1) Typical: As required to comply with deflection criteria.
2) Partitions Supporting Wall Mounted Casework: 16 ga. minimum.

2. Depth: As indicated.

C. Deflection Track: ASTM C645 top runner with 2 inch (50.8 mm) deep flanges. Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting

from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs; one of the following:

1. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
2. Metal-Lite, Inc.; Slotted Track.
3. The Steel Network, Inc; VertiClip SLD Series or VertiTrack VTD Series.

D. Firestop Track: ASTM C645 top runner with 2 inch (50.8 mm) deep flanges. Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs; one of the following:

1. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
2. Metal-Lite, Inc.; The System.
3. The Steel Network, Inc: VertiClip SLD Series or VertiTrack VTD Series.

E. Flat Strap and Backing Plate: 36 inch wide steel sheet for blocking and bracing required for the attachment of surface mounted items and accessories indicated.

1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).

F. Cold-Rolled Channel Bridging: For channel bridging for fixture attachment or lateral bracing provide 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange:

1. Depth: 1-1/2 inches (38.1 mm).
2. Clip Angle: 1-1/2 by 1-1/2 inch (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm) .
2. Depth: 7/8 inch (22.2 mm).

H. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.

I. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members securely to substrates involved; complying with the recommendations of the gypsum board manufacturers for applications indicated..

2.4 INTERIOR GYPSUM WALLBOARD

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

B. Gypsum Wallboard: ASTM C 36 or ASTM C1396/C1396M.

1. Regular Type:

a. Thickness: 5/8 inch (15.9 mm), unless otherwise indicated.
b. Long Edges: Tapered.
c. Location: Vertical surfaces, unless otherwise indicated.

2. Type X:

a. Thickness: 5/8 inch (15.9 mm).
b. Long Edges: Tapered.
c. Location: Where required for fire-resistance-rated assembly.

C. Sag-Resistant Gypsum Wallboard for Interior Ceilings: ASTM C 36 or ASTM C1396/C1396M, manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 5/8 inch (12.7 mm).
2. Long Edges: Tapered.
3. Location: Ceiling surfaces.

2.5 TILE BACKING PANELS

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

B. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C1396/C1396M.

1. Core: 5/8 inch (15.9 mm).

2.6 TRIM ACCESSORIES

A. Interior Steel Trim Accessories: ASTM C 1047; formed metal sheet steel zinc coated by hot dipped process. Shapes indicated below by reference to Fig. 1 designations in ASTM C1047.

1. Cornerbead: Use at outside corners.
2. LC-Bead with both face and back flanges to receive joint compound; use at exposed panel edges.
3. U-Bead with face and back flanges; face flange formed to be left without application of joint compound: Use where indicated.
4. Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings.

B. Aluminum Trim Accessories: Extruded aluminum trim with ¼" diameter holes in fins for attachment to wallboard or studs; longest lengths available in profiles indicated; primed for finish painting; sized for scheduled wallboard thickness shown.

2.7 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of the wallboard products and joint treatment materials for each application indicated.

B. Joint Tape:

1. Interior Gypsum Wallboard over Metal Studs: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, flanges of trim accessories, and fasteners, use setting-type taping compound.

3. Second coat: For filling over tape, beads and fasteners. Use setting-type, sandable topping compound.
4. Third coat: For finishing over tape, beads and fasteners. Use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping and setting-type, sandable topping compounds.
2. Cementitious Backer Units: As recommended by manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

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

D. Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell, compressible, non-extruding, sound transmission reducing, vinyl foam tape strips with approximately 13 Shore 00 hardness that allow fastener penetration without foam displacement, 1 inch thick, in width 1/2" less than window mullion width.

1. V730 Norton Sealant Tape; gray color.

E. Window Mullion Fillers: Refer to Division 5 Section, 'Decorative Formed Metal.'

F. Sound Attenuation Blankets, and Fire Resistive Insulation for Installation Within Gypsum Wallboard Partitions: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from slag wool, or rock wool.

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

G. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

H. Wood Blocking and Trim Not Concealed in Partition Construction: Refer to Section 064023, INTERIOR ARCHITECTURAL WOODWORK.

I. Wood Blocking and Plywood Concealed in Partition Construction: Fire retardant treated, refer to Section 061053, MISCELLANEOUS ROUGH CARPENTRY.

J. Metal Post for Tube Framing at Partial Height Walls: Refer to Section 055000, METAL FABRICATIONS.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed door frames and structural framing with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. 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-on fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. General: Install steel framing to comply with ASTM C754, ASTM C840 and the gypsum board manufacturers recommendations, where standards conflict the more stringent shall apply.

B. Install supplementary framing, blocking, backerplates and bracing at locations in gypsum board assemblies which are indicated to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement.

1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.

a. Use deep-leg deflection track where indicated.
b. Use proprietary firestop track where indicated.

3.4 INSTALLING STEEL SUSPENDED CEILING FRAMING

A. Suspend ceiling hangers from building structure as follows:

B. Suspended Ceiling Framing:

1. Suspend ceiling hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. 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 the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Attach hangers to structural members. Do not support ceilings from or attach hangers to permanent metal forms, steel deck tabs, steel roof decks, ducts, pipes, or conduit.
4. Secure wire hangers by looping and wire-tying, to eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
5. Secure rod and flat hangers to structure, including intermediate framing members, by attaching to 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.

C. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.

D. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

E. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards unless more stringent spacings are recommended by the gypsum board manufacturer.

F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

A. Install continuous runners (tracks) sized to match studs at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction. Secure runners to substrates with fasteners spaced a maximum of 24" o.c. unless closer spacing is recommended by the framing manufacturer for the floor and ceiling construction involved. Provide fasteners at all corners and ends of runner tracks.

1. Where studs are installed directly against exterior walls, install foam gasket isolation strip between studs and wall.

B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings and at partial height partitions. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and

decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.

3. Terminate partition framing at suspended ceilings where indicated.
4. Terminate partial height partition framing as indicated.

D. Install steel studs and furring in sizes and at spacings indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified, unless more stringent requirements are recommended by the gypsum board manufacturer:

1. Space studs 16 inches o.c., unless otherwise indicated.

E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

F. Install backerplates for support of wall mounted items.

G. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. 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.

1. Install two studs at each jamb, unless otherwise indicated. Install one additional stud no more than 6" from jamb studs at single doors greater than 4'-0" and at all pairs of doors.
2. Install cripple studs at head adjacent to each jamb stud. Provide runner track and typical studs above door openings with studs spaced not more than 24" o.c.
3. At all welded frames with fixed anchor clips secure stud reinforcing to jamb anchor clips with not less than two self tapping screws per clip.
4. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

H. 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.

I. Isolation Strip Attachment: Where partitions abut exterior wall window mullions, and partition filler panels are not indicated, adhesively attach isolation strips to window mullions. Center isolation strips on mullion to form a continuous, sound resistant and lightproof, recessed joint seal for the entire length of the interface between the partition studs and trim members and the vertical window mullions.

3.6 APPLYING AND FINISHING PANELS

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840, GA-216, and the gypsum wallboard manufacturer's recommendations, where standards conflict, the more stringent shall apply.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated. Install ceiling

board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints or avoid them entirely.

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

D. Multilayer Application:

1. 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.

2. On Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply base 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 joints, unless otherwise indicated or required by fire-resistance-rated assembly.

E. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

F. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.

G. Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: For substrates indicated to receive thin-set tile, install water-resistant gypsum backing board panels, unless otherwise indicated. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

H. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. 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.

I. 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.

J. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

K. Attach gypsum panels to framing provided at openings and cutouts.

L. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Fit gypsum panels around ducts, pipes, and conduits.
2. Where partitions intersect open concrete coffers, concrete joists, exterior and interior wall kickers, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
3. Where chase walls are shown, provide bracing between parallel rows of studs. Unless otherwise shown, provide gypsum wallboard braces no less than 1/2" thick x 12" wide and cut to width of chase. Locate at quarter points in wall height between each pair of parallel studs. Fasten with not less than 3 screws at each stud.

M. Isolate perimeter of non-load-bearing gypsum board 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 U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

N. STC-Rated Assemblies: Seal construction at perimeters, 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 manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

O. Cut openings in wallboard for electrical outlets, piping and other penetrations. Maintain close tolerances so that edges will be covered by plates and escutcheons. Cut both face and back paper. Do not install electrical outlets back to back on opposing sides of partitions.

P. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.
2. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.
3. Install fasteners not less than 3/8" from ends or edges of wallboard sheets, spacing fasteners opposite each other on adjacent ends or edges.
4. Begin fastening from center of wallboard and proceed toward edges and corners.
5. Apply pressure on surface of wallboard adjacent to fasteners being driven to ensure that wallboard will be secured tightly to supporting members.

    a. Drive fastener with shank perpendicular to face of board.
    b. Drive screws with a power screwdriver as recommended by wallboard manufacturer. Set heads of screws slightly below surface of paper without cutting paper.

3.7 INSTALLING TRIM ACCESSORIES

A. General: Fasten trim accessories according to manufacturer's written instructions for type, length, and spacing of fasteners.

B. Install corner beads at external corners.

C. Install interior trim accessories where edge of gypsum panels would otherwise be exposed or semiexposed. Provide interior trim accessories with face flange formed to receive joint compound.

D. Install aluminum trim accessories where indicated.

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Apply joint treatment at gypsum board joints, flanges of interior trim and aluminum trim accessories, interior angles, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration and levels of gypsum board finish indicated. Produce surfaces free of tool marks and ridges ready for decoration of type indicated. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Cementitious Backer Units: Finish according to manufacturer's written instructions.

E. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated .
3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

3.9 CLEANING AND PROTECTION

A. Clean floors of all wallboard debris and leave broom clean. Excess material, scaffolding, tools and other equipment are to be removed upon completion of the work.

B. Provide final protection and maintain conditions that ensures gypsum board assemblies remain without damage or deterioration at time of Substantial Completion. .

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ceramic, porcelain and quarry tile.

1.2 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.
2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8.

1.3 SUBMITTALS

A. Product Data: Submit product data for each product indicated.

B. Samples: Submit samples showing full range of color and texture variations expected.

1. Full size units of each type, composition, color, and finish of tile.
2. Assembled samples with grouted joints for each color grout and for each type, composition, color, and finish of tile.
3. Thresholds in 6-inch (150-mm) lengths, each type.

C. Test Reports: Submit test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile products with requirements specified for slip resistance.

D. Maintenance instructions: Submit maintenance instructions for each type of product specified.

1.4 QUALITY ASSURANCE

A. Installer: Engage an installer, with a minimum of 5 years of successful commercial tile installations similar in material, design, and scope to that indicated.

B. Source Limitations for Tile: Obtain tile from one source or producer, and from same production run and of consistent quality in appearance and physical properties for each contiguous area.

C. Field-Constructed Sample Installations: Before installing tile, erect sample installations for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build sample installations to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate sample installations on site, in locations and size indicated or, if not shown or indicated, as directed by Architect but not less than 100 square foot area for floors, and not less than 100 square foot area for walls.
2. Retain and maintain sample installations during construction in undisturbed condition as a standard for judging completed unit of Work.

3. Approved sample installations may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

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

B. Maintain temperatures at 50□F or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.7 EXTRA MATERIALS

A. Provide attic stock equal to the following for each type, color, pattern, and size (or fraction thereof) of tile provided for the project. Supply in manufacturer=s unopened containers, identified with name, brand type, grade, class and all other qualifying information, to a location where directed by the Owner.

1. 2% of amount installed but not less than one box.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Products and Manufacturers: Provide tile matching the Architect's samples which have been selected from the product lines and manufacturers indicated in the Finish Schedules on the Drawings.

B. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

C. Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing where applicable.

2.2 ACCESSORY MATERIALS

A. Thresholds: Fabricate to provide transition between adjacent floor finishes. Bevel edges at 1:2 slope, limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold.

1. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.

   a. Description: Uniform, fine- to medium-grained white stone with gray veining.

B. Waterproofing for Toilet Room Tile Installations:

1. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement which are compatible with mortar bed specified and complying with ANSI A118.10; one of the following:

   a. Custom Building Products; Trowel & Seal Waterproofing and Anti-Fracture Membrane.

   b. LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.

   c. MAPEI Corporation; PRP M19.

2.3 SETTING AND GROUTING MATERIALS

A. Manufacturers:

1. Custom Building Products.
2. LATICRETE International Inc.
3. MAPEI Corporation.

B. Source Limitations: For each tile installation, obtain compatible formulations of setting and grouting materials containing latex or latex additives from a single manufacturer.

C. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1A and as specified below:

1. Reinforcing Wire Fabric: Galvanized, flat, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

2. Latex Additive: Manufacturer's standard styrene-butadiene-rubber water emulsion, serving as replacement for all gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

D. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4 consisting of the following:

1. Prepackaged dry-mortar mix combined with liquid-latex additive.
2. For wall applications, provide nonsagging mortar.
3. For glass tile applications use mortar that will not show through glass tile bodies.

E. Medium-Bed, Latex-Portland Cement Mortar: ANSI A118.4:

1. Prepackaged dry-mortar mix combined with liquid-latex additive.

F. Polymer-Modified Tile Grout: ANSI A118.7.

1. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
2. Colors: As selected by Architect from manufacturers standards to match tile being grouted.

2.4 MISCELLANEOUS MATERIALS

A. Sealants: 'Silicone sanitary sealant', as specified in Section 079200, JOINT SEALANTS.

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

2.5 MIXING MORTARS AND GROUT

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

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETING

A. Prior to the installation of tile, and at the Contractor's direction, meet at the project site to review the material selections, substrate preparations, installation procedures, coordination with other trades, special details and conditions, standard of workmanship, and other pertinent topics related to the Work. The meeting shall include the Owner, Architect, the Contractor, tile installer, tile and setting material manufacturer's representatives, and representatives of other trades or subcontractors affected by the installation.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds. Grind concrete substrates to remove existing floor adhesive and mortar residues, films, sealing and curing compounds if they are determined to be present on the substrate.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.3 PREPARATION

A. Remove paint, coatings, including curing compounds and other substances that are incompatible with tile-setting materials.

B. Blending: Color blend tiles at Project site before installing.

1. Furnish the same lots, batches, etc. within the same contiguous areas of the site (i.e. corridors on the same floors, common rooms which adjoin each other, etc.).

3.4 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area beginning at thresholds. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Movement (Expansion) Joints: Locate sealant filled expansion joints where recommended by the manufacturers of mortar and tile materials but not less than the requirements of TCA EJ171, and as accepted by the Architect. Form movement joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.5 WATERPROOFING INSTALLATION

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

1. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 FLOOR TILE INSTALLATION

A. Thin set Tile over Concrete Slabs (Typical): Install in accordance with the mortar manufacturer's recommendations and requirements indicated below for ANSI setting bed methods, TCA installation methods related to types of sub floor construction, and grout ANSI installation methods and grout types. Where recommendations and methods conflict, the manufacturer's recommendations shall apply.

1. Mortar: Latex-Portland Cement Mortar: ANSI A108.5.

2. Concrete Sub-floors, Interior: TCA F113.

   a. With a trowel, having notches sized as recommended by the mortar manufacturer, comb the surface of the mortar with the notched side of the trowel removing excess mortar. Spread only as much mortar as can be covered in the time limits established by the mortar manufacturers recommendations.
   b. Wipe the back of each tile, with a damp sponge, to remove all dust or dirt immediately before applying mortar to tiles.
   c. Immediately after wiping tile backs, but prior to placing tile, the mortar shall be troweled to back of tile for 100% coverage to thickness of not less than 1/16".
   d. Place tiles onto mortar bed, maintaining 1/8" wide joints, and true accurate pattern as shown. Exercise care to quickly remove spillage from faces of tile using water. Rake out joints to depth required to receive grout as tile units are set.
   e. Prohibit foot and wheel traffic on tiled floors for period of time as recommended by the mortar manufacturer.

3. Grout Installation, Latex-Portland cement: ANSI A108.10.

B. Thin set Tile over Waterproof Membrane (Toilet Rooms): Install in accordance with the mortar manufacturer's recommendations and requirements indicated below for ANSI setting bed methods, TCA installation methods related to types of sub-floor construction, and grout ANSI installation methods and grout types. Where recommendations and methods conflict, the manufacturer's recommendations shall apply.

1. Mortar: Latex-Portland Cement Mortar: ANSI A108.5.

2. Concrete Sub-floors, Interior: TCA F122.

   a. Apply the mortar to waterproofed slab with the flat side of the trowel.
   b. With a trowel, having notches sized as recommended by the mortar manufacturer, comb the surface of the mortar with the notched side of the trowel removing excess mortar. Spread only as much mortar as can be covered in the time limits established by the mortar manufacturers recommendations.
   c. Wipe the back of each tile, with a damp sponge, to remove all dust or dirt immediately before applying mortar to tiles.
   d. Immediately after wiping tile backs, but prior to placing tile, the mortar shall be troweled to back of tile for 100% coverage to thickness of not less than 1/16".
   e. Place tiles onto mortar bed, maintaining 1/8" wide joints, and true accurate pattern as shown. Exercise care to quickly remove spillage from faces of tile using water. Rake out joints to depth required to receive grout as tile units are set.
   f. Prohibit foot and wheel traffic on tiled floors for period of time as recommended by the mortar manufacturer.

3. Grout Installation, Latex-Portland cement: ANSI A108.10.

C. Medium set Tile (Only where indicated): Install in accordance with the mortar manufacturer's recommendations and requirements indicated below for ANSI setting bed methods, TCA installation methods related to types of sub-floor construction, and grout ANSI installation methods and grout types. Where recommendations and methods conflict, the manufacturer's recommendations shall apply.

1. Mortar: Latex-Portland Cement Mortar: ANSI A108.5.

2. Concrete Sub-floors, Interior: TCA F113 except apply medium set bed thickness.

   a. With a trowel, having notches sized as recommended by the mortar manufacturer, comb the surface of the mortar with the notched side of the trowel removing excess mortar. Spread only as much mortar as can be covered in the time limits established by the mortar manufacturers recommendations.
   b. Wipe the back of each tile, with a damp sponge, to remove all dust or dirt immediately before applying mortar to tiles.
   c. Immediately after wiping tile backs, but prior to placing tile, the mortar shall be troweled to back of tile for 100% coverage to thickness of not less than 1/16".
   d. Place tiles onto mortar bed, maintaining 1/8" wide joints, and true accurate pattern as shown. Exercise care to quickly remove spillage from faces of tile using water. Rake out joints to depth required to receive grout as tile units are set.
   e. Prohibit foot and wheel traffic on tiled floors for period of time as recommended by the mortar manufacturer.

3. Grout Installation: Latex-Portland cement: ANSI A108.10.

D. Stone Thresholds: Install stone thresholds in one piece, notched to fit neatly at door jambs; set in same type of setting bed as abutting field tile in accordance with TCA Method TR611.

3.7 WALL TILE INSTALLATION

A. Install in accordance with the mortar manufacturer's recommendations and requirements indicated below for ANSI setting bed methods, TCA installation methods related to types of construction, and grout ANSI installation methods and grout types. Where recommendations and methods conflict, the manufacturer's recommendations shall apply.

1. Latex Portland Cement Mortar Installation (using specified latex Portland cement mortar material): ANSI A108.5.

2. Cementitious Backerboard (Latex Portland Cement Mortar) Method: TCA W244, place tiles maintaining 1/8" wide joints, and true accurate pattern as shown.

3. Grout Installation: Latex-Portland cement: ANSI A108.10.

3.8 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

D. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

END OF SECTION 093000

SECTION 096513 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes resilient wall base and accessories..

1.2 SUBMITTALS

A. Product Data: Submit product data for each product indicated.

B. Samples: Submit samples for each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

1.3 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

1.4 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. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT WALL BASE

A. Products and Manufacturers: Refer to the Finish Schedule and the drawings. Nominal thickness not less than 1/8" unless greater thickness is scheduled. Provide all resilient wall base in continuous coils for minimum field butt joints.

2.2 RESILIENT MOLDING ACCESSORY

A. Description: Reducer strip for resilient floor covering

B. Material: Rubber.

C. Profile and Dimensions: As indicated on the drawings.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based formulation provided or approved by resilient product manufacturers for applications indicated.

B. Adhesives: Water-resistant type recommended by the resilient wall base and accessories manufacturer to suit resilient products and substrate conditions indicated.
1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Cove Basr Adhesives: 50 g/L.
   b. Rubber Floor Adhesives: 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

3.3 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Remove adhesive and other blemishes from exposed surfaces.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION 096513

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SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes resilient floor tile.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated.

B. Samples: Submit full-size units of each color and pattern of resilient floor tile required.

C. Maintenance Data: Submit maintenance data for resilient floor tile and floor finish products.

1.3 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

1.4 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. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 RESILIENT FLOOR TILE

A. Products and Manufacturers: Refer to the drawings and the Finish Schedule. Nominal thickness not less than 1/8" unless greater thickness is scheduled.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

D. Vinyl Composition Tile Protective Floor Polish: Product recommended by manufacturer to suit resilient products indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

3.2 PREPARATION

A. Prepare concrete substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare concrete substrates as follows:

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove paint, sealers, substrate coatings, existing floor covering adhesive residues (if any), and other substances that are incompatible with adhesives using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Apply primer to concrete slabs, if recommended by the flooring manufacturer, prior to application of adhesive.

F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.

G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 INSTALLATION

A. Lay out tiles so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis unless otherwise indicated. .

B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings. Extend unexposed edges of flooring under set on bases and similar trim work.

D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation which is smooth, clean and free from imperfections such as open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.
4. Do not wash or apply floor polishes until flooring adhesives have cured unless otherwise recommended by the flooring manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes using methods as recommended in writing by the floor

polish manufacturer. Apply no fewer than 2 coats of floor polish unless additional coats are recommended by the floor polish manufacturer for the application indicated.

a. Use commercially available product acceptable to manufacturer.

2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.

3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 096519

SECTION 096813 – TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes carpet tile.

1.2 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

1. The Carpet and Rug Institute "The Carpet Specifiers' Handbook."

2. The Carpet and Rug Institute "CRI 104 Commercial Carpet Installation Standard."

1.3 SUBMITTALS

A. Product Data: Submit product data, specifications, installation instructions for materials specified herein and other data as may be required to show compliance with the Contract Documents. Include installation recommendations for each type of substrate required.

B. Shop Drawings: Submit shop drawings showing the following:

1. Existing floor materials to be removed.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Pattern of installation, carpet locations, direction, and starting points per floor.
5. Type, color, and location of insets and borders.
6. Type, color, and location of edge, transition, and other accessory strips.
7. Transition details to other flooring materials.

C. Samples: Submit samples showing full range of color, texture, and pattern variations expected. Prepare samples from same material to be used for the Work. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules. Submit the following:

1. Carpet Tile: Full-size Samples.
2. Exposed Edge Stripping and Accessory: 12-inch- (300-mm-) long Samples.

D. Maintenance Data: Submit copies of instructions for care, cleaning, maintenance and repair of carpeting.

1. Each carpet manufacturer shall meet with the authorized Building Services personnel in the presence of the Owner, to review the characteristics of his product and to recommend appropriate maintenance procedures, prior to occupancy of the finished spaces.

E. Warranty: Submit special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage a carpet installer, who has completed a minimum of three (3) projects over the last 10 years which were similar in material, design and extent to that indicated for the project - as determined by the Architect – and which have resulted in construction with a record of successful in service performance.

1. In the case where the Installer is actually a Dealer, it is understood that the terms Installer, Dealer, Carpeting Contractor and Contractor shall be one and the same for purposes of this Contract. He shall assume responsibility for all of the work, including acquisition of the materials from the manufacturers herein specified.

B. Mill Inspection: The carpeting may be inspected to determine compliance with the Contract Documents with respect to manufacture, materials, pattern and colors. Inspection may be made at the mill by a representative of the Architect and/or Owner at any time during the process of manufacture.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver carpeting in original mill protective wrapping with mill register numbers and tags attached.

B. Deliver other materials in manufacturers unopened containers identified with name, brand, type, grade, class, and other qualifying information.

C. Store materials in a dry location, in such a manner as to prevent damage.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 WARRANTY

A. Special Carpet Manufacturer's Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, wear, static buildup in excess of 3.0 kV when tested under the Standard Shuffle Test at 70 degrees F. and 20% RH, edge raveling without seam sealers, tuft bind loss, zippering (wet or dry), shrinkage, curling, doming, snags, runs, and delamination. Warrantees shall be full term, not pro-rated for the specified warranty period.

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

B. Special Carpet Tile Installer's Warranty: Written warranty, signed by carpet tile installer agreeing to fix, repair or replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than edge raveling, shrinkage, curling, doming, and delamination.

1. Warranty Period: 2 years from date of Substantial Completion.

1.8 EXTRA MATERIALS AND ATTIC STOCK

A. Extra Materials: Furnish extra materials described below before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

B. Attic Stock: Package and deliver usable remnants of carpet to the Owner's storage room as directed by the Owner at the conclusion of the job. Include any uncut carpet tiles.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Carpet Tile Types: Provide manufacturers commercial grade carpet tile for 100% glue down installation as scheduled on the drawings.

B. VOC Limits: Provide carpet that complies with the following limits for VOC content when tested according to ASTM D 5116:
1. Total VOCs: 0.5 mg/sq. m x h.
2. 4-PC (4-Phenylcyclohexene): 0.05 mg/sq/ m x h.
3. Formaldehyde: 0.05 mg/sq. m x h.
4. Styrene: 0.4 mg/sq. m x h.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Portland cement-based formulation provided by or recommended by carpet tile manufacturer. Do not use gypsum based compounds.

B. Carpet Adhesives: Water-resistant, mildew resistant, and nonstaining, high solids, low VOC emitting formulations that are specifically recommended by the carpet manufacturer, as verified through compatibility and adhesion testing for the intended substrate and application, and that comply with flammability requirements for installed carpet.
1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:
   a. Total VOCs: 10.00 mg/sq. m x h.
   b. Formaldehyde: 0.05 mg/sq. m x h.
   c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

C. Carpet Edging: Provide homogenous vinyl or rubber composition carpet edging in single lengths wherever possible, keeping the number of joints or splices to a minimum. Provide in quantities and locations as job required based upon the recommended good practice of the industry; include in every location where carpet terminates and other flooring continues. Color to match adjacent carpet types.

D. Floor Sealer: Type as recommended and manufactured by the carpet tile manufacturer for the applications indicated.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETING

A. Prior to the installation, and at the Contractor's direction, meet at the project site to review the material selections, substrate preparations, installation procedures, coordination with other trades, special details and conditions, standard of workmanship, and other pertinent topics related to the Work. The meeting shall include the Owner, Architect, the Contractor, the installer, material manufacturer's representatives, and representatives of other trades or subcontractors affected by the installation.

3.2 PREPARATION

A. Coordinate the installation of carpet so as not to delay the occupancy of the site or interfere with the completion of construction.

B. Examine the substrates, adjoining construction and the conditions under which the Work is to be installed. Verify recommended limits for moisture content and alkalinity of concrete substrates with carpet manufacturer.

1. Moisture Content: Verify moisture content using a standard calcium chloride crystal test or a 1 yd. x 1 yd. clear plastic test. Perform testing at a frequency as recommended by the carpet manufacturer. Perform testing at a frequency of not less than once every 1,000 square feet.

2. Alkalinity Test: Verify alkalinity of concrete substrates by drilling a 3/8" diameter hole approximately 1/4" deep, remove all residue; fill with distilled water, allow water to stand 3 minutes and test with a calibrated electronic meter or Ph paper. Perform testing at a frequency of not less than once every 1,000 square feet.

3. Alternative test procedures for moisture content and alkalinity may be acceptable subject to the carpet manufacturer's review and written acceptance.

C. Concrete Subfloors: Verify that concrete slabs comply with the following:

1. Provide one of the following:

a. Remove coatings, including curing compounds, existing floor covering adhesive residues, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the carpet manufacturer.

b. In lieu of mechanical substrate preparation methods the Contractor may utilize floor sealer materials and methods of the types and methods as recommended, in writing, by the carpet tile manufacturer. Apply sealer in number of coats, and at the spread rate, as required by the carpet tile manufacturer.

2. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the carpet manufacturer.

3. Use leveling and patching compounds recommended by flooring manufacturer for filling cracks, holes and depressions in the substrate. Surface shall be smooth, level and at

proper elevation. Remove ridges, roughness and protrusions from concrete surfaces by grinding.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

E. Carpet installation shall not commence until painting and finishing work are complete and ceiling and overhead work is tested, approved, and completed.

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

3.3 INSTALLATION

A. General: Comply with the manufacturer's instructions, specified industry standards and recommendations, and as required to match the accepted sample installations. Apply adhesive in accordance with adhesive manufacturer's directions.

B. Adhere all full size, perimeter tiles, and cut tiles, with a full spread of adhesive. Dry fit cut tiles and apply adhesive to tile back after tile has been cut. Use full uncut tiles down the center of corridors and, where necessary, cut perimeter tiles to butt walls.

1. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

2. Cut openings in carpet for electrical outlets, piping and other penetrations. Maintain close tolerances so that edges of carpet will be covered by plates and escutcheons.

3. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

C. Butt carpet tile tightly together to form seams without gaps or entrapped pile yarns and aligned with adjoining tiles.

D. Edge Strip Installation: Install edge strip at every location where edge of carpet is exposed to traffic, unless otherwise indicated. Unless otherwise directed by Architect install in single lengths and secure in accordance with manufacturer's directions.

E. Traffic over adhesive installations shall be restricted until adhesive has properly cured in accordance with the adhesive manufacturers recommendations.

3.4 CLEANING AND PROTECTION

A. Cleaning: As the carpeting is installed, remove and dispose of all trimmings, excess pieces of carpeting and laying materials from each area as it is completed. Vacuum carpeting with a commercial vacuum, having a cylindrical brush or beater bar and high suction. Remove adhesives, stains, and soil spots in accordance with the carpet manufacturers recommendations.

B. Protection: Protect carpeting against damage of every kind as damaged carpeting shall be rejected. Use non-staining cover material for protection. Tape joints of protective covering.

1. Plastic and polyethylene sheet protective coverings shall not be permitted.

2. Remove and replace rejected carpeting with new carpeting. At the completion of the work and when directed by the Architect, remove covering, vacuum clean carpeting and remove soiling and stains (if any) to the satisfaction of the Architect.

END OF SECTION 096813

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and field painting of exposed interior items and surfaces.

B. Paint exposed surfaces. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

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

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.

1.3 SUBMITTALS

A. Product Data: Submit product data for each paint system indicated. Include block fillers and primers.

B. Samples: Submit samples for each color and material to be applied, with texture to simulate actual conditions.

1. Provide stepped Samples, defining each separate coat, including primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit paint samples on 12" square of hardboard for the Architect's review of each color and texture required.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

1.5 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Benjamin Moore & Co. (Benjamin Moore).
2. Duron Paints & Wallcoverings (Duron).
3. M. A. Bruder & Sons, Inc. (M. A. B. Paint).
4. PPG Industries, Inc. (Pittsburgh Paints).
5. Sherwin-Williams Co. (Sherwin-Williams).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. VOC Classification: Provide materials, including primers, undercoats, and finish-coat materials, that meet the following criteria for VOC classification when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
2. Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.
3. Anticorrosive Coatings: VOC content of not more than 250 g/L.
4. Varnishes and Sanding Sealers: VOC content of not more than 350 g/L.
5. Stains: VOC content of not more than 250 g/L.
6. 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).

C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

D. Colors: Provide custom colors of the finished paint systems to match Architect's samples.

2.3 COLOR SCHEDULE

A. Reference to a particular manufacturer's number or color name is used only as a convenience for the Architect in order to establish the Project color requirements. These references are not intended to describe the required generic paint systems. For generic paint systems requirements, refer to the "Schedule of Interior Painting" as applicable to the respective conditions of use.

B. The selection of paint colors are indicated on the drawings by manufacturer and color type; designated as "P-__ " for interior paint finishes.

1. Furnish the same lots, batches, etc. within the same contiguous areas of the building (i.e. corridors on the same floors, common rooms which adjoin each other, etc.).

C. Color Schedule: The color schedule shall be considered as a guide only to color requirements; subject to Architect's modification or acceptance. For color schedule, refer to Finish Schedules on Drawings.

2.4 PREPARATORY COATS

A. Concrete Unit Masonry Block Filler: High-performance latex block filler manufactured by finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

B. Interior Primers: Interior latex-based primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

1. Ferrous-Metal Primer: Quick drying, rust-inhibitive metal primer.
2. Zinc-Coated Metal Primer: Galvanized metal primer.
3. Interior Concrete Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
4. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
5. Interior Wood Primer: Factory-formulated acrylic-latex-based interior wood primer.
6. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

2.5 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.
1. Benjamin Moore; Pristine Eco Spec Interior Latex Flat Finish: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
2. Duron; Genesis Interior Latex 60-101: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

3. M. A. B. Paint; Enviro-Pure Latex Flat 040 Line: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
4. Pittsburgh Paints; Pure Performance Interior Wall Flat Latex 9-100: Applied at a dry film thickness of not less than 1.6 mil.
5. Sherwin-Williams; Harmony Latex Flat B5 Series: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

B. Interior Flat Latex-Emulsion Size: Factory-formulated flat latex-based interior paint.

1. Benjamin Moore; Pristine Eco Spec Interior Latex Flat Finish: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
2. Duron; Genesis Interior Latex Flat 60-101: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
3. M. A. B. Paint; Enviro-Pure Latex Flat 040 Line: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
4. Pittsburgh Paints; Pure Performance Interior Wall Flat Latex 9-100: Applied at a dry film thickness of not less than 1.6 mil.
5. Sherwin-Williams; Harmony Latex Flat B5 Series: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

C. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.

1. Benjamin Moore; Eco Spec Interior Latex Eggshell Enamel No. 223: Applied at a dry film thickness of not less than 1.4 mils ((0.036 mm).
2. Duron; Genesis Interior Latex Low Sheen Enamel 79-101: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
3. M. A. B. Paint; Enviro-Pure Eggshell 045 Line: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
4. Pittsburgh Paints; Pure Performance Interior Eggshell Wall and Trim 9-300: Applied at a dry film thickness of not less than 1.5 mils (0.036 mm).
5. Sherwin-Williams; Harmony Latex Eggshell B9 Series: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).

D. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.

1. Benjamin Moore; Eco Spec Interior Latex Semi-Gloss Enamel No. 224: Applied at a dry film thickness of not less than 1.4 mils ((0.036 mm).
2. Duron; Genesis Interior Latex Semi-Gloss Enamel 83-101: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
3. M. A. B. Paint; Enviro-Pure Semi-Gloss 047 Line: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
4. Pittsburgh Paints; Pure Performance Interior Enamel Wall & Trim Semi-Gloss Latex 9-500: Applied at a dry film thickness of not less than 1.5 mils (0.028 mm).
5. Sherwin-Williams; Harmony Interior Latex Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted or provide surface-applied protection before surface preparation and painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified. Provide barrier coats over incompatible primers or remove and reprime.

1. Cementitious Materials: Prepare concrete, concrete unit masonry surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

2. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
b. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances in accordance with SSPC SP 1 "Solvent Cleaning". After solvent cleaning prepare any bare metal surfaces by removing all stratified rust (rust scale), all loose mill scale, all loose or non-adherent rust and detrimental welding deposits by methods specified in SSPC SP-3 "Power Tool Cleaning".

a. Touch up bare areas, heads of bolts, welded surfaces which are unpainted, and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents in accordance with SSPC SP-1 "Solvent Cleaning", and pretreat in accordance with the recommendations of SSPC "Good Painting Practice", Vol. 1, Chapter 22.

5. Gypsum Wallboard: Repair all surfaces in gypsum wallboard with wallboard joint finishing compound or spackling compound, filled out flush and sanded smooth. Clean all surfaces and taped joints of dust, dirt and other contaminants and be sure they are thoroughly dry before applying paint.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General Application: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces. Access panels, electrical panels, air diffusing outlets, supply and exhaust grilles, louvers, exposed conduit, primed hardware items, primed outlet covers, primed wall and ceiling plates and other items in painted areas shall be painted to match the areas in which they occur unless otherwise directed by the Architect.
8. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended

by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

1. Mechanical items to be painted include, but are not limited to, the following:

   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 "all-service jacket" or other paintable jacket material.
   g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical items to be painted include, but are not limited to, the following:

   a. Conduits and fittings.
   b. Switchgear.
   c. Panelboards.
   d. Electrical equipment that is indicated to have a factory-primed finish for field painting.

F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

G. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime

coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

I. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 INTERIOR PAINT SCHEDULE

A. Concrete and Masonry (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:

1. Flat Acrylic Finish: Two finish coats over a primer.

a. Primer: Interior concrete and masonry primer.
b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior concrete and masonry primer.
b. Finish Coats: Interior low-luster acrylic enamel.

3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior concrete and masonry primer.
b. Finish Coats: Interior semigloss acrylic enamel.

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Flat Acrylic Finish: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior low-luster acrylic enamel.

3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior semigloss acrylic enamel.

4. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior full-gloss acrylic enamel.

C. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:

1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior wood primer for acrylic-enamel finishes.
b. Finish Coats: Interior low-luster acrylic enamel.

2. Semigloss Acrylic-Enamel Finish: Two finish coats over a wood undercoater.

a. Primer: Interior wood primer for acrylic-enamel finishes.
b. Finish Coats: Interior semigloss acrylic enamel.

3. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a wood primer.

a. Primer: Interior wood primer for acrylic-enamel finishes.
b. Finish Coats: Interior full-gloss acrylic enamel.

D. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Flat Acrylic Finish: Two finish coats over a primer.

a. Primer: Interior ferrous-metal primer.
b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior ferrous-metal primer.
b. Finish Coats: Interior low-luster acrylic enamel.

3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior ferrous-metal primer.
b. Finish Coats: Interior semigloss acrylic enamel.

4. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior ferrous-metal primer.
b. Finish Coats: Interior full-gloss acrylic enamel.

E. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:

1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.

a. Finish Coats: Interior flat latex-emulsion size.

END OF SECTION 099123

SECTION 10 21 13- TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes toilet compartments and screens as follows:

1. Type: Solid-plastic, polymer resin [HDPE]
2. Compartment Style: Overhead braced and floor anchored.
3. Screen Style: Floor and ceiling anchored.

B. References
1. Americans with Disabilities Act Accessibility Guidelines.
2. ANSI A208.1 – Mat Formed Wood Particleboard.
3. APA – American Wood Association
4. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details of installation, and attachments to other Work.

C. Samples: For each exposed finish and for each color and pattern required.

D. Product certificates.

E. Maintenance data.

1.3 QUALITY ASSURANCE

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

B. Field Measurements: Verify that field measurements are as indicated on shop drawings. Advise manufacturer of any changes.

C. Delivery Storage & Handling: Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from all possible damage. Inspect cartons at the time of delivery and advise carrier of any damage immediately.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Knickerbocker Partition Corporation, Metropolitan Style, or comparable product by one of the following:
1. Accurate Partitions Corporation.
2. Capitol Partitions, Inc.
3. Compression Polymers Group; Comtec Industries.
4. Crane Plumbing; Sanymetal.
5. Global Steel Products Corp.
6. Santana Products, Inc.

2.2 MATERIALS

A. Panel, Pilaster, and Door Material:

1. Solid-Plastic, Polymer Resin: High-density polyethylene (HDPE) with homogenous color throughout. Provide material not less than 1 inch (25 mm) thick with seamless construction and eased edges. Doors and panels shall be a minimum of 55" high and extend 14" off of the floor. Bottom edges shall have an aluminum heat-sinc strip.

a. Color: Cocoa Dapple #SP 533K. Final color to be selected from Manufacturer's full range of colors.

b. Metropolitan Pilasters: Shall be 1" thick, constructed the same as the panels, doors, and urinal screens. Bottom of pilasters shall have adjustable floor anchor with leveling device, anchor studs and locking nuts to firmly secure pilasters to the floor. This entire assembly to be concealed with a 4" high stainless steel plinth, secured in place with one-way through-bolts.

c. Headrail: Pilasters, when set in place, shall be securely braced with 1" x 1-1/2" anodized anti-grip headrail bracing. Headrail to seat on top of pilaster and securely fastened with theft-resistant screws.

B. Pilaster Shoes and Sleeves (Caps): Stainless steel, 4 inches (75 mm) high.

C. Continuous Brackets: Stainless steel.

2.3 FABRICATION

A. Toilet Compartments: overhead braced and floor anchored.

B. Urinal Screens: Floor and ceiling anchored.

C. Solid-Plastic, Polymer-Resin Units: Provide aluminum heat-sink strips at exposed bottom edges of panels and doors.

D. Doors: Unless otherwise indicated, 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 indicated to be accessible to people with disabilities.

E. Door Hardware: Stainless steel. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.

1. Hinges: Self-closing type, adjustable to hold door open at any angle up to 90 degrees.
2. Latches and Keepers: Recessed unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Coat Hook: Combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Rubber-tipped bumpers at out-swinging doors or entrance screen doors.
5. Door Pull: Provide at out-swinging doors. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

F. Overhead Bracing: 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.

G. Floor Anchoring: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of posts. Provide shoes and sleeves [caps] at posts to conceal anchorage.

H. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of posts. Provide shoes and sleeves [caps] to conceal anchorage.

I. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units rigid, straight, level, and plumb, with not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and

walls. Provide brackets, pilaster shoes, bracing, and other components required for a complete installation. Use theft-resistant exposed fasteners finished to match hardware. Use sex-type bolts for through-bolt applications.

1. Brackets: Align brackets at pilasters with brackets at walls. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
2. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

END OF SECTION 10 21 13
10155/11-99/dub

SECTION 102800 – TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Toilet accessories and framed mirrors.

B. Related Work:
   1. *055000 Metal Fabrications: Backing and metal framing for attachment and support of accessories.*
   2. 092900 Gypsum Board Systems: Framing for accessories.
   3. 102113 Toilet Compartments: Openings for accessories.

1.02 REFERENCES

A. Americans With Disabilities Act Accessibility Guidelines (ADAAG).

B. American National Standards Institute (ANSI).

C. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

F. Federal Specification FF DD-G-451c.

1.03 SUBMITTALS

A. Shop Drawings:
   1. Provide plans showing locations of accessories.
   2. Identify accessory types, using same designations as found on Drawings.
   3. Provide sections to indicate locations and sizes of rough openings to receive accessories. Indicate backing and framing locations required for attachment and support. Indicate method of cutting openings in each substrate or finish. Indicate method of attachment and show details for attachment devices.
   4. Provide elevations showing locations of accessories and relationships to finishes, partitions, plumbing fixtures or devices.
   5. Include dimensions on Shop Drawings to indicate compliance with disabled access requirements.

B. Product Data: Manufacturer's data sheets, parts list and installation requirements.

C. Maintenance data, operating instructions and keys required for each type of locked accessory.

1.04 QUALITY ASSURANCE

A. Comply with the recommendations of American National Standards Institute (ANSI).
B. Comply with the recommendations of The Americans With Disabilities Act Accessibility Guidelines (ADAAG).

1.05 PRODUCT HANDLING

A. Deliver items in manufacturer's original unopened protective packing. Store materials in original protective packaging to prevent soiling, physical damage, or wetting. Handle in a manner to avoid damage to finish surfaces.

1.06 WARRANTY

A. Warrant mirrors for five years against silver spoilage.

B. Warrant accessories for five years against corrosion, failure of operating hardware or moving parts.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless steel: ASTM A666, Type 304; Provide ratio of 18% chromium and 8% nickel. Finish: No. 4 (satin).

B. Chrome plating: ASTM B456, Type SC2.

C. Mounting devices: ASTM A123 galvanized steel.

D. Mirrors: FF DD-G-451c, polished plate or float glass recommended for high humidity use, with silvered, metal covered backs, stainless steel frames, minimum 1/4" thick.

2.02 ACCESSORY LIST

A. Refer to schedule on Drawings. Include all screws, fittings, anchors, etc., as required for complete installation.

B. Handy-Shield Safety Covers for under-sink supply lines and drain line, color white; contact Plumberex Specialty Products (800)4-PLUMBX.

2.03 FABRICATION

A. Fabricate units with seamless one piece flange on exposed face. Weld corners, leaving no open miters.

B. Master key locked dispensing units. Key coin boxes separately from dispensing unit.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Check openings in substrates to receive accessories. Verify openings are correctly located and sized to receive accessories, and that locations will comply with disability access requirements. Confirm that blocking, backing or support is properly located and adequate for the accessory installation.

B. Verify spacing of plumbing fixtures and toilet partitions. Confirm spacing and locations are compatible with proposed accessory locations and will allow compliance with disability access requirements.

3.02 INSTALLATION

A. Drill holes to correct size and application that is concealed by item with ¼ inch tolerance.

B. Mount recessed accessories into wall openings with sheet metal screws into metal frames.

C. Mount surface mounted accessories to backing plates with machine screws, plumb and align.

3.03 ADJUST AND CLEAN

A. Adjust accessories for proper operation. After completion of installation clean and polish all exposed surfaces. Deliver keys and instruction sheets to Owner.

END OF SECTION 102800

SECTION 104400 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fire protection specialties.

1.2 SUBMITTALS

A. Product Data: Submit product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.

1. Fire Extinguishers: Include rating and classification.
2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, panel style.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

C. Listing: Fire extinguishers shall be UL listed with UL Listing Mark for type, rating, and classification of extinguisher.

1.4 COORDINATION

A. Coordinate size of fire-extinguisher cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.5 WARRANTY

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

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each fire extinguisher cabinet and at other locations indicated.

1. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher indicated and with plated or baked-enamel finish.

a. Provide brackets for extinguishers located and not located in cabinets.

B. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, in enameled-steel container.

2.2 FIRE-EXTINGUISHER CABINETS

A. General: Provide fire extinguisher cabinets of suitable size for housing fire extinguishers of types and capacities specified.

B. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

1. Fire-Rated Cabinets: Listed and labeled to meet requirements in ASTM E 814 for fire-resistance rating of wall where it is installed.

a. Construct fire-rated cabinets with double walls fabricated from 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.

2. Cabinet Metal: Enameled-steel sheet.
3. Cabinet Mounting: Recessed unless otherwise indicated.
4. Cabinet Trim Style: Trimless with hidden flange of same metal and finish as box that overlaps surrounding wall finish and that is concealed from view by an overlapping door.
5. Cabinet Trim Material: Manufacturer's standard steel sheet.
6. Door Material: Manufacturer's standard steel sheet.
7. Door Glazing: Manufacturer's standard, as follows:

a. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, Class 1 (clear).

8. Door Style: Manufacturer's standard design vertical duo panel with frame with 1/4" thick glass.
9. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
10. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide exposed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

C. Products and Manufacturers: One of the following:

1. Larsens Manufacturing Company: Occult Series Fire Extinguisher Cabinets, Model O-2409 with vertical duo door.

2. Potter Roemer: Dana Series Fire Extinguisher Cabinets, 7220-DV.

3. JL Industries, Inc.: Embassy Series Fire Extinguisher Cabinets, Model 5614-Contemporary V door.

2.3 FINISHES

A. General: Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.

B. Painted Finishes: Provide painted finish to comply with requirements indicated below for extent, preparation and type:

1. Color: Provide color or color matches indicated, or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

2. Preparation: Clean surfaces of dirt, grease, and loose rust or mill scale.

3. Field-Paintable Factory Finish: Immediately after cleaning and pretreatment, apply to surfaces indicated below, manufacturer's standard factory-applied paint system which is suitable, after deglossing, as an undercoat for field-applied paint system specified in Division 9 Section 'Interior Painting'.

a. Exterior of cabinet except for those surfaces indicated to receive another finish.

b. Interior of cabinet.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

A. General: Follow manufacturer's printed instructions for installation.

B. Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
1. Fasten cabinets to structure, square and plumb.

3.3 ADJUSTING AND CLEANING

A. Adjust cabinet doors to operate freely without binding. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

B. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION 104400

SECTION 113100 - PANTRY APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes pantry appliances.

1. The extent of pantry appliance work is indicated on the drawings and in the Equipment Schedules.

1.2 SUBMITTALS

A. Product Data: Submit product data and roughing in diagrams for each type of appliance required indicating compliance with requirements. Include complete operating characteristics, dimensions of individual appliances, finishes for each appliance, and maintenance instructions for each appliance.

1.3 QUALITY ASSURANCE

A. UL and NEMA Compliance: Provide electrical appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

B. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the Federal Trade Commission.
1. For those appliances that are applicable, provide only appliances that carry an Energy Star label.

1.4 WARRANTY

A. Submit written warranties, executed by manufacturer of each appliance required agreeing to repair or replace appliances or components that fail in materials or workmanship within the manufacturers standard warranty period.

PART 2 - PRODUCTS

2.1 PANTRY APPLIANCES

A. Provide product listed in Equipment Schedules and on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for plumbing, mechanical, and electrical services, to verify actual locations of services before equipment installation.

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

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions.

B. Built-in Appliances: Securely anchor to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

C. Freestanding Appliances: Place in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Utilities: Refer to the Drawings and Divisions 15 and 16 for plumbing and electrical requirements.

3.3 ADJUSTING AND CLEANING

A. Test each item of appliances to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from appliances and leave units in clean condition, ready for operation.

END OF SECTION 113100

SECTION 124816 - ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes recessed foot grilles and frames.

1.2 SUBMITTALS

A. Product Data: For each type of foot grille and frame.

B. Shop Drawings: Show the following:

1. Items penetrating foot grilles and frames.
2. Divisions between grille sections.
3. Perimeter floor moldings.

C. Samples: For each type of product involving color selection.

1. Foot Grille: 12-inch- (300-mm-) square assembled sections.
2. Frame Members: 12-inch- (300-mm-) long Sample of each type and color.

D. Maintenance data.

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:

C. Basis-of-Design Product: Subject to compliance with requirements, provide C/S Group 5/8" "Gridline" or a comparable product by one of the following:

1. ARDEN Architectural Specialties, Inc.
2. Balco, Inc.
3. Crowder, K. N. Manufacturing, Inc.
4. J. L. Industries, Inc.
5. Kadee Industries, Inc.

2.2 MATERIALS

A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

B. Stainless-Steel Angles: ASTM A 276 or ASTM A 479/A 479M, corrosion resistant, Type 304.

2.3 FOOT GRILLES

1. [

B. Stainless-Steel Foot Grille:

1. Surface Treads: 0.071-by-0.177-inch (1.8-by-4.49-mm) wire with 0.125-inch- (3.17-mm-) wide openings between wires.
2. Support Rods: Spaced 1 inch (25 mm) o.c., welded to each wire.
3. Mat Grating: 5/8 inch (16 mm) deep.
4. Pit Grating: 1-1/8 inches (28.5 mm) deep.
5. Stainless-Steel Finish: No. 4 finish.
6. Grille Size: As indicated.

2.4 FRAMES

A. Provide manufacturer's standard frames of size and style for grille type.

2.5 DRAIN PANS

A. Provide manufacturer's standard 0.060-inch- (1.52-mm-) thick stainless-steel sheet drain pan with NPS 2 (DN 50) drain outlet for each floor grille unit. Coat bottom of pan with protective coating recommended by manufacturer.

2.6 FABRICATION

A. Shop fabricate foot grilles to greatest extent possible in sizes as indicated.

B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install recessed foot grilles and frames to comply with manufacturer's written instructions at locations indicated and with top of foot grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set foot-grille tops at height for most effective cleaning action. Coordinate top of foot-grille surfaces with doors that swing across grilles to provide clearance under door.

3.2 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in foot-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124816

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SECTION 15010 MECHANICAL GENERAL

1.0 GENERAL

1.01 DESCRIPTION

A. This Division 15 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the air conditioning, ventilating, heating, fire suppression and plumbing systems as specified herein and as shown.

B. The General Provisions and Division 1, including the general, supplementary and other conditions and other Divisions, as appropriate, apply to work specified in this Division.

1.02 INTENT OF DRAWINGS AND SPECIFICATIONS

A. The implied and stated intent of the drawings and specifications is to establish minimum acceptable standards for materials, equipment and workmanship, and to provide operable mechanical systems complete in every respect.

B. The engineering drawings are diagrammatic, intended to show general arrangement and sizes of system components, and shall not be scaled. Rather, the architectural and structural drawings shall govern space constraints, dimensions and finishes. All offsets and fittings which will be necessary to accomplish the finished installation shall be provided at no additional cost or increase in the Contract.

1.03 SPACE PRIORITY

A. Ensure optimum use of available space for materials and equipment installed above ceilings. Allocate space in the order of priority as listed below except as otherwise detailed. Items are listed in the order of priority, with items of equal importance listed under a single priority number.

1. Gravity flow piping systems
2. Vent piping systems
3. Recessed lighting fixtures
4. Concealed HVAC terminals and equipment
5. Air duct systems
6. Sprinkler piping systems
7. Pressurized piping systems
8. Electrical conduit, wiring, control air tubing

B. Order of space priority does not dictate installation sequence. Installation sequence

shall be as required to install all affected trades.

C. The work of this Division 15 shall not obstruct access for installation, operation and maintenance of the work of any other Division.

D. All major items of equipment shall be arranged so as to provide a minimum of 28" clear aisle space. Additional space shall be provided between and around equipment for maintenance and proper operation as shown in the equipment manufacturer's literature.

1.04 COORDINATION

A. Coordinate all work under this Division 15 with work under all other Divisions, providing adjustment as necessary.

B. Coordination of space requirements with respect to Division 16 shall be performed such that:

1. No equipment, piping or ductwork, other than electrical, shall be installed within 42" of switchboards or panelboards.

2. No piping or ductwork which ever operates at a temperature in excess of 120 degrees F. shall be installed within 3" of any electrical conductor.

C. All items mounted in or below the ceiling, and all items penetrating the ceiling, shall be coordinated with the architectural reflected ceiling plans. If any items are not shown on these plans, or any items need to be relocated for coordination purposes, prepare a reflected ceiling plan and submit it to the Architect for approval.

1.05 CODE COMPLIANCE

A. All workmanship and materials provided under this Division 15 shall comply with all laws, ordinances, codes and regulations of all Federal, State and Local Authorities having jurisdiction.

B. All fire suppression, plumbing, heating, ventilating, and air conditioning materials and workmanship shall comply with the following codes and standards as minimum requirements:

1. North Carolina State Building Code - 2006 edition.

2. North Carolina State Energy Code - 2006 edition.

3. North Carolina State Fire Prevention Code – 2006 edition.

4. North Carolina State Mechanical Code - 2006 edition.

5. North Carolina State Plumbing Code - 2006 edition.

C. Secure and pay all fees associated with all permits and licenses required for execution

of the Contract. Arrange for all inspections required by city, county, state and other authorities having jurisdiction, and deliver certificates of approval to the Architect.

D. The code requirements are strictly a minimum and shall be met without incurring additions to the Contract. Where requirements of the drawings or specifications exceed the code requirements, the work shall be provided in accordance with these drawings or specifications. In the event of conflict or ambiguity between the various codes, the most stringent requirement shall govern.

1.06 ELECTRICAL REQUIREMENTS AND INTERFACE

A. All electrical equipment and wiring provided under this Division 15 shall comply with the electrical system characteristics indicated on the electrical drawings and specified in Division 16.

B. Electric controls, contactors, starters, pilot lights, push buttons, etc., shall be provided complete as part of the motor, heater or other equipment which it operates. All electrical components shall be in conformance with the requirements of the National Electrical Code and Division 16. Reference Division 16 and the electrical engineering drawings for those motor starters provided under that Division 16. All starters not shown shall be provided under this Division 15. Unless specified otherwise under other individual equipment Sections, motor starters shall conform to the following minimum requirements:

1. Starters for motors 1/3 horsepower or smaller shall be manual unless remote or automatic starting is required, in which case the starters shall be magnetic, full voltage, non-reversing, single-speed, unless otherwise indicated. All other starters shall be magnetic.

2. Each starter for a three-phase motor shall be furnished with three (3) overload relays sized for the full load running current of the motor actually provided. Provide an external "HAND-OFF-AUTO" selector switch with red "RUNNING" light. Provide a green pilot light to indicate motor "STOPPED". Each pilot light shall have a legend plate indicating reason for signal.

3. Each overload relay shall have a normally open alarm contact which will close only when actuated by an overload (not to be confused with N.O. or N.C. auxiliary contacts). These contacts shall be properly wired to their respective blue pilot light provided on the starter front cover and having a "TRIPPED" legend plate.

4. Individually mounted motor starters shall be in a NEMA Type 1 general purpose enclosure in unfinished areas and shall be flush mounted in all finished areas. All starters mounted in exterior areas shall have a NEMA 3R enclosure. Each starter shall have a laminated nameplate to indicate equipment unit number, function and circuit number.

5. All motor starters, push buttons and pilot lights shall be of the same manufacturer as the switchboard and shall be General Electric, Square D, Siemens I.T.E., or Westinghouse.

C. Motor starters for the following equipment shall be provided under this Division 15 by the manufacturer of the equipment:

1. Packaged air conditioning equipment

2. Other equipment hereinafter specified in other Sections to be provided with integral starters.

D. Unless otherwise noted or specified in individual Sections, all 3-phase motors shall be standard NEMA continuous duty "B" type, with Class B insulation, open drip-proof frame for indoor service, TEFC for outdoor service and a service factor of 1.15. All motors 5 HP and larger shall be U.S. Motors Hi-Efficiency Model or Reliance XE Hi-Efficiency Model.

E. All power wiring and final connections to equipment shall be provided under Division 16.

F. Control components, all interlocks (motor-operated dampers, fire alarm motors, etc.) and control wiring (120 volt, single phase and less) shall be provided under this Division 15 as required to achieve the specified control sequences.

G. All control wiring over 30 volts shall be installed by a Licensed Electrician working under this Division 15.

1.07 SLEEVES, SEALS AND ESCUTCHEONS

A. Sleeves shall be provided through all pipe penetrations of concrete or masonry walls, elevated floors and roofs, except those plumbing piping penetrations for fixtures, vents, etc.

B. Sleeves shall be fabricated from Schedule 40 steel pipe through 10" and Standard Wall steel pipe for sleeve sizes 12" and larger. All sleeves penetrating exterior walls, underground walls, pit or vault walls shall be provided with a 3" x 3/8" thick water stop ring welded completely to the midpoint of the sleeve.

C. All sleeves penetrating exterior walls, underground walls, pit or vault walls and elevated floors shall be packed and sealed watertight.

D. Sleeves through roofs shall extend above the roof surface and be flashed watertight.

E. Sleeves through walls shall be cut and finished flush with each surface of the wall in which they are installed.

F. Sleeves shall be sized to provide a minimum of 1/2" clearance between the inside surface of the sleeve and the outside finished surface of the pipe plus any insulation specified.

G. Fire-stops shall be provided as specified herein. All annular spaces between piping and sleeves which do not require fire-stops shall be packed with mineral wool and

caulked.

H. Provide round, chrome-plated escutcheons on all exposed piping penetrations passing through walls, floors, partitions and ceilings.

1.08 FIRE-STOPS

A. Where ductwork, piping, conduit, etc. pass through fire partitions, fire walls and floors, a fire-stop shall be provided that will ensure an effective barrier against the spread of fire, smoke and gases. Fire-stop material shall be packed tight and completely fill gaps between the ductwork, piping, conduit, etc. and the perimeter of their rough openings.

B. Fire-stopping material shall maintain its dimensions and integrity while preventing the passage of flame, smoke and gases under conditions of installation and use when exposed to the ASTM E119 time-temperature curve for a time period equivalent to the rating of the assembly penetrated. Fire-stopping material shall be noncombustible as defined by ASTM E136; and, for insulation materials, melt point shall be a minimum of 1700 degrees F. for 1-hour protection and 1850 degrees F. for 2-hour protection. Fire-stopping material shall be Dow-Corning RTV Foam or 3M Fire Barrier Products or Sohio Carborundum Fyre Putty.

C. See Section 15400 for fire-stopping of PVC piping.

1.9 CORE DRILLING

A. Cutting of holes through concrete and masonry shall be by diamond core or concrete saw. Pneumatic hammer, impact electric and hand or manual hammer type drills will not be allowed, except as permitted by the Architect where required by limited working space. Locate holes such that they will not affect structural sections such as ribs or beams. Holes shall be laid out well in advance of the installation. These layout locations shall be approved by the Architect prior to drilling.

2.0 PRODUCTS

2.01 BID BASIS AND SUBSTITUTION PROCEDURES

A. Manufacturers names, series and model numbers, as noted or specified, are for the purpose of describing type, capacity, and quality of equipment, materials and products to be used. Unless "or equal" is specifically stated, bids shall be based only on the specified "basis of design" manufacturer. The listing of a particular manufacturer as an "equal" or "acceptable substitute" manufacturer shall not be misconstrued as approving nor allowing the substitution of that manufacturer's standard product in place of the basis of design. No consideration will be given to a product which would require dimensional, spatial or aesthetic changes to the project. "Acceptable substitute" and "equal" manufacturers shall only bid those products which exactly match the size and other characteristics of the specified basis of design. Any changes to other disciplines and trades of work required by an "or equal" or "substitute" product shall be duly considered and priced accordingly prior to bidding or pricing. The decision as to whether or not a proposed substitute or "equal" product is actually equal to that specified shall rest solely with the Architect.

B. Requests to provide "equal" products in lieu of those specified shall be submitted to the Architect in writing at least ten (10) days prior to final pricing and execution of the Contract. No consideration will be given to substitute products after final pricing and execution of the Contract.

C. Any "or equal" product or proposed product substitution which will cause a change in the appearance, dimensions or design of any part of the building, it structure, electrical system or any other engineered systems shall be accompanied by a scaled drawing and written description of the required change(s) for approval by the Architect . If deemed necessary by the Architect, design changes shall be signed and sealed by a registered Professional Engineer, currently licensed in this State.

2.02 MINIMUM STANDARDS

A. Every piece of energy consuming equipment, all fire suppression products and life safety equipment shall comply with the following standards as applicable; especially in regard to prevailing codes:

1. Factory Mutual Laboratories (FM)
2. Industrial Risk Insurers (IRI)
3. Underwriters Laboratories, Inc. (UL)
4. ADC: Air Diffusion Council
5. AGA: American Gas Association
6. AMCA: Air Moving and Conditioning Association, Inc.
7. ANSI: American National Standards Institute
8. API: American Petroleum Institute
9. ARI: American Refrigeration Institute
10. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
11. ASME: American Society of Mechanical Engineers
12. ASTM: American Society of Testing and Materials
13. AWWA: American Water Works Association
14. IBR: Institute of Boiler and Radiator Manufacturers
15. MSS: Manufacturers Standardization Society

16. NBBPVI: National Board of Boiler and Pressure Vessel Inspectors

17. NEMA: National Electrical Manufacturer's Association

18. OSHA: Occupational Safety & Health Administration

19. PDI: Plumbing Drainage Institute

20. PPI: Plastic Pipe Institute

21. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.

3.0 EXECUTION

3.01 SUBMITTALS

A. Before preparing submittals, study all Contract Drawings and specifications in detail, obtain manufacturer's recommended instructions, and have submittals prepared based on specific equipment and material proposed for installation. An officer of the contracting firm shall sign all shop drawings (certifying conformance with plans and specifications) before submitting to the Architect or releasing to the field.

B. The submittal process shall not be utilized as an avenue to substitute products after the execution of the contract. Should an unspecified or unequal product be submitted, it will be rejected. If a second attempt at substitution is made during the resubmittal of the same product, then no more reviews of that product will be performed without direct compensation to the Engineer being paid for the additional services required for the third review and any further reviews.

C. No more than four (4) copies of submittal data will be reviewed. Any additional copies will be returned unmarked. The responsibility of copying review comments on any additional copies will rest solely with the Contractor.

D. Submittals will not be accepted for review unless they:

1. Comply with the requirements of Division 1.

2. Include complete information pertaining to all appurtenances and accessories.

3. Are submitted as complete packages which pertain to all related items in Division 15. Separate packages shall be submitted as follows:

   a. All HVAC equipment and components

   b. All plumbing equipment, fixtures and components

4. Are properly marked with equipment, service or function identification as related to the project and are marked with pertinent specification paragraph number.

E. Submit catalog information, factory assembly drawings, field installation drawings and certifications as required for complete explanation and description of all items of equipment. The submittal data shall provide ample, unquestionable compliance with the Contract Documents.

F. Review of submittals shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly identified and separately submitted in the form of a letter that is enclosed with the submittals.

G. Submittals are required on all manufactured equipment, especially energy consuming equipment. Submittals shall include, but are not limited to, the following items of equipment:

1. Piping Specialties
2. Insulation
3. Water Heaters
4. Plumbing Fixtures
5. Heat Pumps
6. Air Distribution Devices
7. Ductwork Accessories
8. Centrifugal Fans
9. Louvers and Hoods

3.02 EXCAVATION, TRENCHING AND BACKFILLING

A. Perform all excavation, trenching and backfilling for underground work under this Division 15. During excavation, the excavated material shall be piled back from the banks of the trench to avoid overloading, slides or cave-ins. Do not exceed the angle of repose unless written approval is obtained in advance from the Architect for shoring, bracing or other alternate excavation methods. All excavated material not used for backfilling shall be removed from the building and disposed of as indicated or directed by the Architect . Take measures to prevent surface water from flowing into trenches and other excavations and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. Tunneling shall not be allowed.

B. The bottom of all trenches shall be evenly graded to provide firm support and an even bearing surface. Pipe shall be laid on firm soil, laid in straight lines and on uniform grades. Provide bell holes so that the barrel of the pipe rests evenly on the bottom of the trench along the entire length of the pipe.

C. Pipe shall be inspected and tested prior to backfilling. Trench shall be handfilled to a

minimum of 12" above the top of pipe with suitable earth (free of rocks, trash, large clods and organic material) and compacted to a minimum 95% proctor. After the first layer is completed, subsequent layers shall be filled and compacted the same as the first layer. Settling the backfill with water shall not be permitted.

3.03 INSTALLATION REQUIREMENTS

A. All equipment shall be installed in strict conformance with the recommendations of the equipment manufacturer, as indicated on the Drawings and as specified.

B. Provide installation manuals for each piece of equipment. Submit in separately bound volumes after review of submittals.

C. Provide supplementary steel framing and welded steel equipment support stands as required for proper hanging and support of the mechanical systems. Steel angles, channels and tubing utilized for such framing shall be selected for a maximum deflection of 1/360th of the span.

D. All roof curbs shall be a minimum of 12" high and selected for the various roof pitches. Curbs installed on roofs having pitches of not more than 1/4" per foot may be standard curbs shimmed level with steel channels or Zs to provide suitable support and flashing surfaces.

3.04 CLEANING, LUBRICATION AND ADJUSTMENT

A. The exterior surfaces of all mechanical equipment, piping, ductwork, conduit, etc., shall be cleaned and free of all dirt, grease, oil, paint splatter, and other construction debris.

B. Ducts, plenums, and air unit casings shall be cleaned of all debris and either vacuumed or blown free of all rubbish, dirt, and dust before installing grilles, registers or diffusers.

C. Bearings that require lubrication shall be lubricated in strict accordance with the manufacturers recommendations.

D. All control equipment shall be adjusted to the settings required for the performance specified.

E. Fans shall be adjusted to the speed indicated by the manufacturer to meet the installed final system pressure at the airflows indicated. Any additional sheaves and belts required for final adjustments shall be provided with no increase in the Contract amount.

F. Any fans operated during construction shall have temporary filters. Temporary filters shall be changed regularly to minimize contamination of the equipment and duct systems. Permanent filters shall be installed prior to final inspection.

G. All coils shall be thoroughly cleaned and combed prior to final inspection.

3.05 PAINTING

A. All uncoated and uninsulated steel surfaces exposed to sight inside the building, such as piping, equipment hangers and supports which are not provided with factory prime coat or galvanizing, shall be cleaned and painted with one coat of rust inhibiting primer. In addition, all surfaces in finished spaces shall also be painted with two coats of finish paint in a color selected by the Architect .

B. All ductwork surfaces visible through grilles, registers and diffusers in finished areas shall be painted flat black.

C. Steel items exposed outside the building, such as equipment supports, uninsulated piping and hangers which are not factory painted or galvanized shall be cleaned and painted with one coat of rust inhibiting primer and two coats of asphaltic base aluminum paint. Insulated steel pipes outside the building shall be cleaned and painted with one coat of rust inhibiting primer before installing insulation.

D. Factory painted equipment that has been scratched or marred shall be repainted to match the original factory color.

3.06 DUCTWORK AND PIPING LEAK TESTING

A. Underground, concealed and insulated ductwork and piping shall be tested for leaks in place before backfilling, concealing or covering. Tests shall be conducted in the presence of the Architect or his designated representative.

B. All low pressure ductwork (design operating pressure of 1.0" W.C. E.S.P. or less) shall be tested by the operation of the system to which it is connected.

C. All visible and audible air leaks from the ductwork systems shall be repaired.

D. Soil, waste, storm and vent piping shall be tested with water before installing fixtures. Water test shall be applied to the system either in its entirety or to the individual sections. Each opening except the highest opening of the section under test shall be plugged, and the section shall be filled with water and tested with a head of water of at least ten (10) feet above the highest point in the system. The water shall be kept in the portion under test, for at least thirty (30) minutes; no drop in the water level will be acceptable.

E. The water piping systems shall be tested at a minimum pressure of 125 psi and proved tight at this pressure for not less than thirty (30) minutes or longer if required to permit inspection of all joints. No loss in pressure will be permitted.

F. All refrigerant piping shall be 100% tested with a halide torch leak detector.

G. All leaks shall be repaired by tightening, remaking joints, or replacing pipe and fittings. Caulking of joints shall not be permitted.

3.07 RECORD (AS-BUILT) DRAWINGS

A. At the completion of the project, provide a set of reproducible sepias to the Architect which reflect all changes, deviations and revisions made to the original design

documents. Locations of all underground piping and utilities shall be clearly shown and dimensioned from permanent reference points such as building column lines.

3.08 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS

A. Complete operating and maintenance manuals shall be provided to the Owner. Four copies shall be provided. Each copy shall be bound in a separate 3-ring, loose leaf notebook. Operating instructions shall be provided for each mechanical system, and shall each include a brief system description, a simple schematic and a sequence of operation. Operating and maintenance instructions shall be provided for each piece of equipment. A control system wiring diagram shall be included in each operating and maintenance manual.

B. Prior to final acceptance or beneficial occupancy, provide the services of a competent technician for not less than one (1) day to instruct the Owner in the operation of the mechanical systems.

3.09 TESTING AND BALANCING

A. Testing and balancing of the HVAC system shall be performed as specified in Section 15043. Note that this work is to be performed under a separate Contract directly under the General Contractor. Submit four (4) copies of the test and balance report directly to the Architect .

3.10 WARRANTY

A. All work provided under this Division 15 shall be subject to a minimum one year warranty. The warranty shall include prompt repair or replacement of equipment or system failures and shall include all parts and labor. In addition, all reciprocating air conditioning compressors shall carry an additional four year parts-only warranty. Extended warranties shall be provided on all other equipment so specified in other Sections.

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SECTION 15043 HVAC TEST & BALANCE

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this Section is governed by the Mechanical General Section 15010.

B. This Section 15043 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the testing and balancing (T&B) of the heating, ventilating and air conditioning (HVAC) systems as specified herein and as shown. These systems include, but are not limited to, the following:

1. Supply distribution systems

2. Return and exhaust air systems

3. Heating, ventilating and air conditioning equipment (all scheduled equipment as a minimum)

1.02 INTENT

A. It is the intent of this Section of the specifications to provide a complete operable and balanced HVAC system as shown and specified which is reasonably airtight, comfortable and free of objectionable noise and vibration.

1.03 SCOPE OF WORK

A. HVAC test and balance shall be performed by an independent agency certified by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) under direct contract to the General Contractor. All work performed by this agency shall be performed by qualified technicians under the direct supervision of an AABC or NEBB certified test and balance engineer. The agency shall be independent and shall not be associated in any way with the installing HVAC subcontractor.

B. HVAC test and balance shall be performed in accordance with the 6th edition of the AABC National Standards, 2002 for Total System Balance or the NEBB Procedural Standards for TAB of Environmental Systems, 7th Edition, 2005 together with the NEBB TAB Manual for Technicians, 2nd Edition.

C. The final T&B report shall serve to substantiate compliance with the intent of the Contract Documents, specifically the HVAC systems.

D. HVAC test and balance shall not begin until the systems are substantially complete.

E. Upon the completion of the T&B work, the Agency shall submit four copies of the complete HVAC Test and Balance Report directly to the Architect.

F. The Agency, as a part of its contract with the General Contractor, shall act as an authorized inspection agency, responsible to the General Contractor and the Architect and shall, during the test and balance, list those items which require correction or have not been installed in accordance with the Contract Documents.

G. The Agency shall plainly mark the settings of all valves, dampers and other adjustable devices. If a balancing device is provided with a memory stop, it shall be set, locked and marked.

1.04 SUBMITTALS

A. The name and certification of the Agency, along with the name and certification of the Certified Test and Balance Engineer, shall be submitted to the Architect for review within 30 days after the award of the general contract.

B. The selected Agency shall submit to the Owner:

1. Procedural Manual

2. Report Forms

3. AABC or NEBB Performance Guaranty

4. Instrument List and Calibration Dates

5. Schedule

C. A reviewed copy of each of the above shall be returned to the Agency before the HVAC Test and Balance begins.

D. If a complete submittal in accordance with these requirements is not received within 60 days from award of the general contract, then the Architect reserves the right to select the Agency.

1.05 PERFORMANCE GUARANTY

A. The agency shall guaranty that all work will be performed in accordance with the applicable standards and procedures, and evidence of the firm's certification shall be provided.

B. In addition to the agency's guaranty, the agency shall provide a written certification from their national governing body that the agency will perform its contracted services in accordance with the applicable standards for the work on this project.

C. Rules and procedures for the quality assurance program shall be provided with the national certification.

2.0 PRODUCTS

2.01 (Not applicable).

3.0 EXECUTION

3.01 GENERAL CONTRACTOR'S DUTIES

A. The General Contractor shall provide the following, within 10 days after his receipt, to the Agency:

1. Contract drawings
2. Contract applicable specification division 15 (others as applicable)
3. Addenda
4. Change orders
5. Reviewed submittals

B. The General Contractor shall start-up and maintain the HVAC systems and shall continue the operation of the HVAC systems during each day of testing and balancing. Start-up and operation shall include, as a minimum, the following:

1. All equipment operable and in safe condition.
2. Temperature control system complete.
3. Proper thermal overload protection in place for electrical equipment.
4. Ductwork leakage rates not exceeding those specified and all duct systems clean of debris.
5. Air transfer systems shall have:
   a. Correct fan rotation and RPM.
   b. Coil fins cleaned and combed.
   c. Filters clean and in place.
   d. Access doors closed.
   e. All dampers in place and open.
   f. All grilles, registers and diffusers installed.

C. Provide sufficient time before final completion date so that testing and balancing can be accomplished. Coordinate the submitted T&B schedule.

D. Provide immediate labor and tools to make required corrections and repairs without undue delay.

E. The General Contractor and his subcontractors shall cooperate fully with the Agency to provide the following:

1. Access to HVAC system components.

2. The right to adjust the systems.

F. Any conditions which prevent a proper HVAC Test and Balance shall be reported by the Agency to the General Contractor and Architect within 7 days of their discovery.

G. If it is determined by the Agency and confirmed by the Architect that drive changes or additional balancing dampers are required, the Contractor shall obtain and install all necessary components.

H. The Agency shall cooperate with the Architect and the Contractor and all his subcontractors to perform the work in such a manner as to meet the job schedule.

I. The Agency shall verify that all system components are in place and in proper working order prior to leaving the project.

J. All reported, recorded data shall represent true measured conditions.

END OF SECTION

SECTION 15066 REFRIGERANT PIPING SYSTEMS

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this Section is governed by the Mechanical General Section 15010.

B. This Section 15066 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the piping systems as specified herein and as shown for the heating, ventilating and air conditioning (HVAC) systems. These piping systems include, but are not limited to, the following:

1. Refrigerant suction and liquid (RS&RL)

2. Condensate drains (DR)

1.02 INTENT

A. It is the intent of this Section of the specifications to provide complete and operable piping systems as shown and specified which are free of leaks, properly vented, free of noise, vibration and sweating, and fabricated so as to fit the space allotted and to exhibit a minimum resistance to fluid flow. It is also the intent of this Section of the specifications to provide a complete piping insulation system which is free of gaps and tears, properly fitted and finished, free of sweating, and fabricated so as to fit the space allotted and to exhibit a negligible heat transfer.

B. The word "piping" is defined to mean all piping, fittings, joints, hangers, coatings, valves, test and sensor wells and accessories necessary for the refrigerant piping systems described, shown and specified.

1.03 GENERAL REQUIREMENTS

A. Provide all reducing fittings, flanges, couplings and unions of the size and type of material to match the piping to each piece of equipment, valve and accessory.

B. Union joints, couplings or flanges shall be provided in each pipe line connected to each piece of equipment and elsewhere as indicated and specified. Unions shall match the piping system in which they are installed.

1. Unions or flanges shall be provided between all copper to steel connections in water-carrying piping. These unions shall be dielectric, insulating type.

C. All changes in direction and branches shall be made with manufactured fittings.

D. All pipe joints shall be cut square and all burrs shall be removed.

E. Fabrication of a bull-head tee connection is strictly prohibited.

F. Open ends of pipe lines not currently being handled shall be plugged during installation to keep dirt, water and foreign material out of the system.

G. Horizontal refrigerant and drain piping shall slope down in the direction of flow at a minimum slope of 1/8" per foot of run.

H. All insulation products installed indoors shall meet NFPA 90A, 90B and 255 requirements for Flame Spread Rating 25 and Smoke Developed Rating 50.

1.04 FIRE-STOPS

A. Where pipes pass through fire partitions, fire walls and floors, install a fire-stop that shall provide an effective barrier against the spread of fire, smoke and gases. Fire-stop material shall be packed tight and completely fill clearances between pipes and openings. Fire-stop material shall conform to the following:

1. Fire-stopping material shall maintain its dimensions and integrity while preventing the passage of flame, smoke and gases under conditions of installation and use when exposed to the ASTM E119 time-temperature curve for a time period equivalent to the rating of the assembly penetrated. Fire-stopping material shall be noncombustible as defined by ASTM E136; and in addition for insulation materials melt point shall be a minimum of 1700 degrees F. for 1-hour protection and 1850 degrees F. for 2-hour protection. Fire-stopping material shall be Dow-Corning RTV Foam or an approved equal.

1.05 ACCEPTABLE MANUFACTURERS

A. Insulation products shall be as manufactured by Rubatex or Armstrong.

2.0 PRODUCTS

2.01 PIPE AND FITTINGS

A. All pipe and fittings shall be products of a domestic manufacturer.

B. Pipe and fittings shall be as listed and outlined below:

	SERVICE	MATERIAL TYPE	SIZES
1.	Refrigerant Suction and Liquid	1	All
2.	Drains*	2	All

*Note: As an option, on cooling coil condensate drains (which are not installed in a plenum) the drain piping may be schedule 40 PVC with solvent joints; subject to advance approval by the Local Authorities. Fittings shall meet ASTM D2466 and solvent shall meet ASTM D2564.

C. The pipe, fittings and joints shall be as outlined below:

1. Material Type 1:

a. Pipe - Type L hard drawn copper tubing meeting ASTM B88 or ASTM B280.

b. Fittings - Wrought copper meeting ANSI B16.22.

c. Joints - Silver brazed with sil-fos or silver solder.

2. Material Type 2:

a. Pipe - Copper drainage tube DWV meeting ASTM B306.

b. Fittings - Wrought copper solder-joint drainage fittings meeting ANSI B16.29.

c. Joints - Soldered with a solder meeting ASTM B32.

2.02 PIPE HANGERS AND SUPPORTS

A. Pipe hangers, trapeze hangers, upper attachments, rods and other supports shall be selected based on pipe size and material contained therein. Provide all hangers, rods, turnbuckles, angles, channels and other supports to securely support the piping systems from the building structure.

B. All materials utilized for the hanging and support of the piping systems shall be manufactured products which are specifically intended for the purpose of hanging piping systems. The use of wire, steel straps, plastic ties, etc. is strictly prohibited.

C. Supports and hangers shall be selected to fit around the pipe (and insulation unless otherwise specified herein) and provide adequate movement for expansion of the piping systems. Anchors shall be provided to restrict and control such movement within offsets and expansion loops.

D. All hangers and supports shall be selected at a minimum factor of safety of five based on the ultimate tensile strength of the material.

E. Intermediate pipe supports shall be provided between building structural members so as not to exceed maximum support spacing specified and shall be structural steel angles (minimum 2 1/2" x 2 1/2" x 1/4"). In steel construction, intermediate supports shall be securely clamped to steel beams and to steel joists, and in no case shall supports be attached to roof decks.

F. For suspending pipes from concrete beams, upper attachments shall be side beam bracket utilizing bolts in sleeves set in top portions of the beams. Where sleeves are not used, provide expansion shields or power-actuated fasteners.

G. Hanger rods for pipe hangers shall be as follows:

HANGER ROD SIZE	NOMINAL PIPE SIZE
3/8"	2" and smaller
1/2"	2 1/2" and larger

H. Pipe hangers selected for supporting horizontal insulated piping shall be sized to fit around the outside of the pipe insulation.

I. Provide pipe saddles and shields on all insulated piping as outlined below:

1. All insulated piping shall be supported on galvanized shields.

a. Shields shall be as follows:

1) Pipes 2" and smaller: 18 gauge x 12" long.
2) Pipes 2 1/2" and larger: 16 gauge x 18" long.

b. Shields shall be 180 degrees around the lower half of the pipe at all pipe hangers, except that on trapeze hangers, pipe racks and floor supported horizontal pipes, shields shall be 360 degrees around the entire pipe.

J. Provide riser clamps at all floor penetrations.

2.03 VALVES

A. All valves shall have the manufacturer's name or trademark and the working pressure cast or stamped on the valve body.

B. All valves shall be designed and constructed for refrigerant service.

2.04 PIPING INSULATION

A. Closed-cell insulation shall be provided over all refrigerant suction piping and other services as specified or noted. Closed-cell piping insulation shall be 1/2" thick 25/50 Armaflex or Rubatex. All glues and coatings shall be products of the same manufacturer as the insulation.

B. Insulation shall be continuous over all valve bodies, fittings, and wall and floor penetrations.

3.0 EXECUTION

3.01 ARRANGEMENT

A. Piping shall follow the general layout, arrangement, schematics, and details. Provide all offsets, vents, drains, charging ports and connections necessary to accomplish the installation. Fabricate piping accurately to measurements established at the project

site to avoid interference with ductwork, other piping, equipment, openings, electrical conduits and light fixtures. Make suitable provision for expansion and contraction with expansion loops and offsets.

3.02 MINIMUM HANGER SPACING

A. Pipe hangers or supports shall be provided within 18" of each horizontal fitting, equipment connection, valve, etc. and at not more than the following spacings along horizontal runs of straight, plain piping:

	Pipe Size	Maximum Span
1.	2" and smaller	8 ft.
2.	2 1/2" and larger	12 ft.

B. Riser clamps shall be provided at each floor penetration.

3.03 UNDERGROUND PIPING

A. All underground piping shall have a minimum cover of 2'-0".

B. All underground copper lines shall be protected from corrosion with a continuous plastic sheathing or coating and wrapping. This sheathing or coating and wrapping shall be extended 6" to 12" above finished floor.

3.04 REFRIGERANT PIPING INSTALLATION

A. All refrigerant piping shall be sized in accordance with the air conditioning equipment manufacturer's written instructions. Provide charging ports, solenoid valves, service valves, dryers, etc. at each piece of equipment.

B. All brazing shall be done while the line is being flushed with carbon dioxide, nitrogen or other inert gases.

C. The inside of all tubing shall be thoroughly cleaned and internally wiped with a lintless, dry cloth.

D. Suction lines shall drop below their coils before any horizontal run.

E. Provide oil traps at least every ten feet for extended vertical risers.

F. All oil traps shall be constructed from close-radius type fittings.

G. Dryer cores shall be installed to remove horizontally or downward.

H. Install external equalizer downstream of its expansion valve sensing bulb.

I. Install expansion sensing valve bulb on top centerline of piping up to 5/8" size; install 45 degrees down from the horizontal centerline on pipe sizes 7/8" and larger.

3.05 CLOSED-CELL PIPING INSULATION INSTALLATION

A. Insulation shall be provided on all refrigerant suction and indoor condensate drain lines. The insulation shall be installed by the slip-on method; slitting of the insulation is prohibited and shall be cause for rejection. All elbows shall be mitered and all such joints and butt joints shall be tightly made and glued.

B. All insulation installed outdoors shall be coated with a glossy white, ultraviolet protective coating applied in two coats; Armacote or approved equal.

END OF SECTION

SECTION 15400 PLUMBING SYSTEMS

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this Section is governed by the Mechanical General Section 15010.

B. This Section 15400 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the plumbing systems as specified herein and as shown. These systems include, but are not limited to, the following:

1. Sanitary waste and vent systems.

2. Domestic water systems.

3. Storm drainage systems.

C. Provide all final plumbing connections to all equipment furnished by Owner.

D. Provide gate valve and reduced pressure backflow preventer or vacuum breaker at the service entrance and at those connections (especially to kitchen equipment) required by local plumbing code.

1.02 INTENT

A. It is the intent of this Section of the specifications to provide complete and operable plumbing systems as shown and specified which are free of leaks, properly vented, free of unreasonable noise, vibration and sweating, and fabricated so as to fit the space allotted and to exhibit a minimum resistance to fluid flow.

B. The word "piping" is defined to mean all piping, fittings, joints, hangers, coatings, valves, cocks, insulation and accessories necessary for the plumbing systems described, shown and specified.

1.03 GENERAL REQUIREMENTS

A. Provide all reducing fittings, flanges, couplings and unions of the size and type of material to match the piping connections at each fixture, piece of equipment, valve and accessory.

B. Union joints, couplings or flanges shall be provided in each pipe line connected to each piece of equipment, fixture and elsewhere as indicated and specified, Unions shall match the piping system in which they are installed.

1. Unions or flanges shall be provided between all copper to steel connections. These unions shall be dielectric, insulating type.

C. All changes in direction and branches shall be made with manufactured fittings.

D. The use of offset-type reducers is strictly prohibited in any piping system.

E. In all water piping systems, changes in horizontal pipe line sizes shall be made with eccentric reducers installed flat on top for proper air venting. Reducing tees, reducing elbows and concentric reducers shall only be allowed in water piping systems for changing pipe sizes in vertical risers and for making connections to equipment and accessories from vertical risers.

F. All pipe joints shall be cut square and all burrs shall be removed.

G. Open ends of pipe lines not currently being handled shall be plugged during installation to keep dirt, water and foreign material out of the system.

H. Sanitary waste and storm drainage piping shall slope down in the direction of flow as shown on the drawings or as prescribed by Code, but not less than 1 percent.

I. All vents through roof (VTR'S) shall be offset just below the roof such that their termination points are at least 10 ft. from any outside air intake of any HVAC unit; special attention is called to packaged rooftop units.

J. Trap primers shall be provided at all floor drains and hub drains.

1.04 IDENTIFICATION OF PIPING

A. All aboveground plumbing systems piping and valves sized 3/4" and larger which are installed in accessible locations (including piping above removable ceilings and behind access panels) shall be identified in strict conformance with the "Scheme for the Identification of Piping Systems" (ANSI A13.1 - 1981).

B. Each identification marker shall include the following:

1. Proper color-coded background.

2. Proper color of legend in relation to background color.

3. Proper legend letter size.

4. Proper marker length.

5. Direction of flow arrow shall be included on each marker.

C. Locations for pipe markers shall be as follows:

1. Adjacent to each valve and fitting.

2. At each branch and riser take off.

3. At each pipe passage through walls, floors and ceilings.

4. On all straight pipe runs every 25 feet.

D. Identification markers may be stenciled or shall be Setmark Pipe Markers, as manufactured by Seton Name Plate Corporation.

E. All valves shall be identified with the appropriate service designation and valve number brass valve tags. Each valve tag shall be 19 gauge brass with 1/4" black-filled letters over 1/2" black-filled numbers. Tags shall be fastened to valves with brass "S" hooks or brass jack chain. Brass tags and fasteners shall be as manufactured by Seton Name Plate Corporation

F. Provide charts of all valves. Valve charts shall include the following items:

1. Valve identification Number

2. Location

3. Purpose/Material

2.0 PRODUCTS

2.01 SANITARY WASTE AND VENT SYSTEMS

A. All underground sanitary waste and vent piping shall be PVC, DWV Schedule 40 with socket-type, solvent welded joints.

B. Cleanouts shall be provided at the locations indicated and, as a minimum, where required by Code. Floor cleanouts shall be a minimum of 4" and shall be complete with a flush plug and removable, scoriated bronze floor plate. Provide carpet buttons in carpeted areas.

C. All above ground sanitary, waste and vent piping shall be hubless cast iron soil pipe.

D. Joints on hubless cast iron soil pipe shall be made with neoprene couplings and stainless steel clamps.

E. Floor drains in toilets and finished areas shall be J. R. Smith 2000 Series with 6" Type B square adjustable strainers finished in satin nickel bronze; or equal products by Josam or Zurn. Provide vandalproof secured tops. All floor drains shall be provided with a trap primer.

F. Floor drains in mechanical rooms and unfinished concrete floors shall be J. R. Smith 2131 Series with round 11 3/4" cast iron grate, sediment bucket and deep-seal P-trap; or equal products by Josam or Zurn. Provide vandalproof secured tops. All floor drains shall be provided with a trap primer.

2.02 STORM PIPING SYSTEMS

A. Storm piping systems shall be of the same materials specified above in 2.01 for the

sanitary, waste and vent systems; note that all aboveground storm piping located within plenums shall be service weight, hubless cast iron soil pipe.

B. Wall cleanouts shall be threaded cleanout tees and plugs with polished stainless steel coverplate with centerset screw.

C. The roof drains shall be selected for the insulated roof decks indicated. The roof drain bodies and receivers shall be of cast iron construction; domes shall be cast iron or aluminum and the roof drains shall be complete with flashing clamps having integral gravel stops, deck clamps, gaskets and trim. Roof drains shall be J. R. Smith 1010 or 1015 Series or approved equal products as manufactured by Josam, Zurn.

D. Area drains (AD) shall be Smith Series 1400 Promenade Deck Drains with square top, seepage holes, clamps and extensions selected for the roof construction assembly.

E. Emergency overflow drains shall be similar to the roof drains except they shall be water dam type. J.R. Smith 1080 or approved equal.

G. Emergency overflow piping termination shall be J.R. Smith SQ-9-2333. Finish shall be brass.

2.03 DOMESTIC WATER SYSTEM

A. Underground domestic water service entrance piping 3" and smaller in size shall be Type K hard drawn copper tubing with wrought copper fittings. All joints shall be brazed.

B. All underground copper branch lines (1/2" and 3/4" only) shall be continuous lengths of soft Type K copper tubing with no joints allowed underground.

C. Underground domestic water service entrance piping above 3" in size shall be Class 150 ductile iron pipe with mechanical joints.

D. Aboveground domestic water system piping 3" in size and smaller shall be Type L hard drawn copper tubing with wrought copper fittings and soldered joints.

E. Aboveground domestic water piping 4" and larger shall by Type L hard drain copper tubing with rolled grooved joints and fittings.

F. Gate valves 3" or less in size shall be constructed with a bronze body, non-rising stem. Stem to be bronze ASTM B-62 or silicon bronze ASTM B-371 with malleable iron handwheels. Valve shall meet MSS-SP80. Valve shall be manufactured by Milwaukee, Hammond, Nibco or Stockham.

G. Ball valves 2 inch and smaller:

1. Ball valves shall be two piece bronze body, large port with solid, smooth bore chrome plated brass ball, meeting MSS-SP110. Seats shall be reinforced TFE with Teflon packing ring and threaded adjustable packing nut. Valves on insulated lines will be provided with stem extensions to provide clearance for

two inches of pipe insulation. Valves to be Apollo 70, Hammond 8501 or Watts B-6000.

H. Non-freeze wall hydrants (NFWH) shall be non-freeze, bronze box type with vacuum breaker, loose key and wall clamp. Finish shall be rough bronze. Wall hydrants shall be Smith 5509QTPB or approved equal by Josam or Zurn.

I. Backflow preventers shall be Watts Series 909 reduced pressure principle backflow preventers complete with strainer and shut-off valves. Air gap drain shall be piped into nearest floor drain or outside of building to a concrete splashblock.

J. Water pressure reducing valves (PRV) shall be the self-contained direct operating type with bronze body, stainless steel seat, stainless steel spring, and sealed spring cage. The strainer shall have bronze body with 20 mesh stainless steel screen. Strainer shall be attached with a bronze nipple. The unit shall be constructed in accordance with ASSE Standard 1003 and shall bear the seal of approval. The capacities shall be based on maximum reduced pressure fall-off, as defined in the ASSE Standard, of 10 pounds. Pressure regulators shall be Watts Regulator Company's Series 223S or approved equal.

K. All water hammer arresters (WHA) shall be PDI Certified, Size A, B, C, D, E or F, as indicated for the fixture units served; Josam, Jay R. Smith or Zurn.

M. The hose bibbs (HB) shall be complete with vacuum breaker and handle.

N. Soldered joints shall be made with tin-antimony/silver solder. Solder containing lead shall not be permitted.

2.04 PLUMBING INSULATION

A. All pipe insulation products shall have a permanent composite insulation, jacket and adhesive fire and smoke hazard rating as tested by procedure ASTM-84, NFPA 255 and UL 723 not exceeding Flame Spread 25 or Smoke Developed 50.

B. Blanket-type insulation shall have an average thermal conductivity not to exceed 0.27 BTU-in. per sq. ft. per degrees F. per hour at a mean temperature of 75 degrees F. Insulation shall have a minimum density of 1 lb./cu.ft. and shall be 2" thick.

C. Preformed insulation for all domestic hot and cold water piping shall be minimum 1" thick preformed fiberglass pipe insulation with white all-service jacket. All longitudinal joints shall be lapped, self-sticking type with all butt joints, tears, etc. sealed with a matching white vapor barrier tape. Elbows shall be mitered or may be Zeston covers filled with equivalent fiberglass insulation. The maximum K value of the insulation shall be 0.23 at 70 degrees F.

2.05 PIPE HANGERS AND SUPPORTS

A. Pipe hangers, hanger rods, trapeze type hangers, upper attachments and other supports shall be selected based on pipe size (plus insulation of pipes specified to be insulated) and the weight of the medium being transported or the medium used for

testing, whichever is greater. Provide all hangers and rods, turnbuckles, angles, channels, and other structural supports to support the piping systems. Rods for pipe hangers shall be full size of the hanger manufacturer's catalog listed rod size for each type hanger specified. Hangers and supports shall be Michigan, ITT Grinnell or B-Line.

B. All material utilized for the hanging and support of the piping systems shall be manufactured products which are specifically intended for the purpose of hanging piping systems. The use of wire, steel straps, plastic ties, etc. is strictly prohibited.

C. Pipe hangers selected for supporting horizontal insulated piping shall be sized to fit around the outside of the pipe insulation. Insulated piping shall be supported on galvanized shields.

1. Shields shall be as follows:

a. Pipes 2" and smaller: 18 gauge x 12" long.

b. Pipes 2 1/2" and larger: 16 gauge x 18" long.

2. Shields shall be 180 degrees around the lower half of the pipe at all pipe hangers, except that on trapeze hangers, pipe racks and floor supported horizontal pipes, shields shall be 360 degrees around the entire pipe.

D. Pipe hangers for copper piping shall be copper plated or the piping shall be dielectrically isolated from any steel hangers or clamps that are used.

E. Steel rods, framing and clamps shall be plated or primed to prevent rust formation.

3.0 EXECUTION

3.01 ARRANGEMENT

A. Follow the general piping layout, arrangement, schematics and details. Provide all offsets, vents, drains and connections necessary to accomplish the installation. Fabricate piping accurately to measurements established at the project site to avoid interference with ductwork, other piping, equipment, openings, electrical conduits and light fixtures. Make suitable provision for expansion and contraction with expansion loops and offsets.

B. Water hammer arresters shall be installed at the top of each riser and on each fixture branch in accordance with Plumbing and Drainage Institute Standard WH201.

C. Cleanouts shall be provided at the base of all sanitary and storm risers.

3.02 UNDERGROUND WATER PIPING

A. All underground domestic water piping shall have a minimum cover of 3'-0".

B. Provide concrete thrust blocks at all changes of direction and secure all mechanical joints with restraining rods.

C. All underground copper water lines shall be protected from corrosion with a continuous plastic sheathing or coating and wrapping. This sheathing or coating and wrapping shall be extended 6" to 12" above finished floor.

3.03 MINIMUM HANGER SPACING

A. Pipe hangers or supports shall be provided within 18" of each horizontal fitting, equipment connection, valve, etc. and at not more than 10 ft. spacings along horizontal runs of straight, plain piping.

B. Riser clamps shall be provided at each floor penetration.

3.04 FIRESTOPPING PVC PIPING

A. PVC storm , soil, waste and vent stacks penetrating fire-rated floors and walls shall be flamestopped, firestopped, and waterproofed using ProSet Systems, Inc. Series 45 "Firestop" couplings and Series 90 "Code Red" firestop devices. All other PVC drain, waste, and vent piping penetrating fire-rated floors shall be firestopped and waterproofed using ProSet Systems Series 48 closet stubs, tub boxes, floor drains, shower drains, and "E-Z Flex" flexible couplings. All shall be installed in accordance with the manufacturer's instructions.

B. ProSet "Firestop" couplings used in the DWV system shall be of type I PVC conforming to ASTM D2665 standard. ProSet "Code Red" stack fittings shall be of gray cast iron conforming to ASTM A-48 standard. ProSet "E-Z Flex" connector couplings shall be of flexible PVC conforming to ASTM C594 and ASTM F477 performance standards. Band used for compression joint on the "E-Z Flex" coupling shall be #300 stainless steel. IPS P-70 Primer and Weld-on 795 cement or equal shall be used for all solvent welds in the system.

3.05 INSULATION INSTALLATION

A. Provide blanket insulation over all horizontal roof drain piping which is within the building and including the vertical risers to the roof drains and the underbody of the roof drains.

1. Blanket insulation shall be wrapped around the piping and underbodies of roof drains. Ends of insulation shall overlap at least 2" and bottom of insulation shall overlap pipe insulation at pipe connection to roof drain at least 3". Adhere insulation to roof drain underbodies with 100% coverage of fire retardant adhesive and tape all joints with 3" wide foil reinforced kraft tape.

B. Provide insulation over all above ground hot and cold water piping, except that no insulation is required on cold water lines installed inside interior plumbing chases (those chases with no exterior wall).

1. All joints and tears shall be sealed with matching white vapor barrier tape.

3.06 PIPING INSTALLATION ABOVE CEILINGS

A. All domestic hot and cold water piping installed above the insulated ceilings shall be installed just above (within 2") of the top of the finished ceiling with the building insulation over the piping to avoid freeze-up.

3.07 DISINFECTION

A. All domestic water piping installed under this Division shall be disinfected with chlorine before it is placed into operation. The chlorinating material shall be liquid chlorine conforming to Federal Specification BB-C-120 and shall be introduced to the system by experienced operators only. The chlorine solution applied to the piping sections or system shall contain at least fifty parts per million of available chlorine and shall remain in the sections or system for a period of not less than sixteen (16) hours. During the disinfection period, all valves shall be opened and closed at least four times. After the disinfection period, the chlorinated water shall be flushed from the system with clear water until the residual chlorine content is not greater than two-tenths parts per million (0.2 PPM). Submit certification to the Architect that the system was disinfected.

END OF SECTION

SECTION 15424 WATER HEATERS AND ACCESSORIES

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this Section is governed by the Mechanical General Section 15010.

B. This Section 15424 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the water heating systems as specified herein and as shown. These systems include, but are not limited to, the following:

1. Water heaters

2. Hot water circulator

2.0 PRODUCTS

2.01 WATER HEATER COMMERCIAL ELECTRIC

A. The water heater shall be A.O. Smith DEN/DEL Series with tank and elements sized per drawing schedule.

B. Water heater shall have an approved working pressure of 150 psi. The tank shall be glass-lined and shall have a magnesium anode to provide electrolytic protection. The entire heater shall be UL listed, shall meet or exceed the ASHRAE Standard 90 for energy efficiency and shall be insulated with high density polyurethane foam insulation for maximum heat retention.

C. Controls shall include an operating thermostat and manual reset high limit control. All controls shall be factory-wired and require no external power source.

D. Water heater shall be provided with access door and ASME T&P relief valve.

2.02 HOT WATER CIRCULATOR

A. Hot water circulator shall be Bell & Gossett Series PR, 1/6 HP, 120 volts, 1 phase.

3.0 EXECUTION

3.01 INSTALLATION

A. The water heaters and accessories shall be installed in strict accordance with the manufacturer's recommendations and the Contract Documents.

B. All temperature and pressure relief valves shall be piped full size to an indirect waste such as the nearest floor drain, service sink, sink tailpiece, etc.

END OF SECTION

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SECTION 15450 PLUMBING FIXTURES AND TRIM

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this section is governed by the Mechanical General Section 15010.

B. This Section 15450 and the accompanying drawings cover the provisions of all labor, fixtures, equipment, appliances and materials, and performing all operations in connection with the construction and installation of the plumbing fixtures and trim as specified herein and as shown.

C. All exposed piping, valves, stops, P-traps, etc. shall be chrome-plated. Also, all exposed piping penetrations through walls, floors or ceilings shall be provided with chrome-plated cast brass escutcheons.

D. All P-traps shall be minimum 17-gauge brass.

E. Flush valves shall have non-hold open feature, vacuum breakers and cover cap on angle-type stop.

F. Provide all final connections to all equipment and fixtures furnished by Owner.

G. Unless otherwise specified in an individual fixture description, all enameled cast-iron and porcelain fixtures shall be white.

1.02 INTENT

A. It is the intent of this Section of the specifications to provide complete, operable, adjusted, clean plumbing fixtures as shown and specified which are free of leaks, noise, air, vibration and waterflow fluctuations.

1.03 BASIS OF DESIGN

A. The basis of design is as outlined for each fixture in the 2.0 PRODUCTS subsection. Any proposed substitutions shall be proven equal in all respects to the equipment specified as the basis of design.

1.04 ACCEPTABLE MANUFACTURERS

A. Acceptable fixture manufacturers are American Standard, Eljer and Kohler provided that their units are equal in all respects for this specific project. Faucets and trim may be equal products as manufactured by Sloan, Chicago, Zurn, T&S Bronze, Brass Works or Speakman.
Flush valves may be equal products by Sloan, Zurn or Hydroteck. Stainless steel sinks and drinking fountains shall be as manufactured by those companies specified for each specific item outlined under subsection 2.0 PRODUCTS.

2.0 PRODUCTS

2.01 WATER CLOSETS

A. Provide solid plastic white toilet seats with each water closet, selected to match the water closet noted. Toilet seats shall be elongated style with open front and check hinge; Beneke or approved equal.

B. Fixtures P-1 shall be American Standard #2258.125 Afwall EL1.6 vitreous china, wall hung, siphon jet action, elongated closet bowl with 1 1/2" back spud with carriers selected to match the chase size indicated. Flush valves shall be Sloan Optima 152-1.6 back spud ES-S- with manual override pushbutton. Fixtures P-1H shall be similar, except that they shall be mounted in accordance with the handicap code.

2.02 LAVATORIES

A. Fixtures P-6 shall be American Standard #0356.015 Lucerne vitreous china, wall hung lavatories with concealed carrier and anchoring screws; hole punching and spacing to match faucet and 1 1/4" drain. Fittings shall be sensor faucet as manufactured by Sloan Optima model EBF-85 or approved equal with chrome plated tailpieces, strainers, P-trap, loose key supply stops and all other trim.

B. Fixtures P-4 shall be American Standard #0476.028 Aqualyn vitreous china, self-rimming, 20" x 17" oval lavatory complete with hole punching and spacing to match faucet and 1 1/4" drain. Fittings shall be sensor faucet as manufactured by Sloan Optima model EBF-187 or approved equal with chrome plated tailpieces, strainers, P-trap, loose key supply stops and all other trim.

C. Fixtures P-2 shall be a multiple lavatory system provided with two hand washing stations. Each hand washing station shall comply with ANSI and ADA accessibility standards. Bowl material for each station shall be SloanStone, the color shall be "Bone". The system shall include plug-in transformer, all waste and supply connections to wall, and thermostatic mixing valve with stop, strainer, and check valve. Each hand washing station shall have a solar powered Optima faucet Model No. EAF-275 and battery powered soap dispenser Model No. EDS-350. Each sensor shall have a 2-3 second turn of delay and automatic shut off after 30-45 seconds of continuous operation. The lavatory shall be SloanStone ELS-72275 or approved equal.

2.03 SINKS

** (Note: To meet ADA sinks depth must be 6½" or less)**

A. *ADA* Fixtures P-8 shall be single compartment, 18 gauge stainless steel with sound-deadening, 25" x 21 1/4" outside dimensions, 21" x 15 3/4" inside dimensions, 6½" deep; Elkay Model No. LRAD 2521. Faucet punching shall be 3 hole O.C. Faucet set shall match the 3 hole punching and shall be deck-mounted, lever-style chrome-plated, all brass, gooseneck faucet with aerator and wrist blade handles; American Standard Heritage 7230 series and a stainless steel drain, cup strainer and rubber stopper. Provide complete trim such as service stops, tailpieces and P-trap.

2.04 URINALS

A. Fixture P-3 shall be American Standard #6506.011 Allbrook vitreous china, 1.0 gallon flush, wall hung siphon jet urinal with integral flushing rim and back spud. Flush valve shall be Sloan Optima Model 195-0.5 ES-S with manual override pushbutton or approved equal.

2.05 SERVICE SINKS

A. Fixture P-7 shall be Kohler #K-6710, 28" x 28" enameled cast iron corner floor service sink complete with K-8940 coated wire rim guard, K-9146 size 3" chromed perforated strainer drain and K-8904 polished chrome faucet with pail hook, hose end, vacuum breaker and wall brace.

2.06 DRINKING FOUNTAINS AND WATER COOLERS

A. Fixtures P-5 shall be a combination standard height and barrier-free, stainless steel drinking fountains and shall provide ample leg room and easy access from sitting position. Fountains shall include self-closing, semi-circular push bar with full 180 degree directional activation, contour-formed oval shape receptor to eliminate splashing and standing water and shall have rounded corners and edges. Fountains shall be complete with stainless steel back panel. Projector shall be chrome-plated two-stream, mound-building type with integral hood guard, stream height regulator and antisquirt feature. Drinking fountains shall be a pair of Elkay Model EDFPAM117RAC with each pair on by a remote chiller certified by ARI to meet Standard 1010-82. Capacity shall be 6.0 GPH of 50 degrees F. chilled water at 90 degrees F. ambient. Provide service stops on inlet and outlet of chiller. Chiller shall operate on 120 volts, 1 phase power supply.

3.0 EXECUTION

3.01 INSTALLATION

A. Units shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades.

B. All plumbing fixtures shall be free of leaks, provided completely finished, trimmed, adjusted, cleaned and ready for use. They shall be properly secured to the structure by the use of thru-bolting, backplates, carriers, expansion shields (for floor mounting only) or toggle bolts.

C. Wall hung fixtures supported on chair carriers shall be bolted to the floor slab. Carefully coordinate space requirements and fixture mounting height requirements with supports being furnished.

D. Fixtures supported with wall hangers on masonry chase walls shall be fastened to the wall with not less than 3/8" bolts which shall pass through the wall and through a 1/4" x 4" wide steel backplate on the unfinished chase wall side.

E. Where fixtures are hung on single masonry walls without a pipe chase behind, they shall

be mounted with 3/8" toggle bolts.

F. Fixtures on steel stud walls shall have a 1/4" x 4" wide steel backplate wired with 1/16" steel wire to the studs. Bolts not less than 3/8" shall secure the fixtures through the fixture hanger and the backplate.

G. All mounting holes provided in fixtures shall be used for support. In addition to the main hangers, 1/4" toggle bolts shall secure the bottom of all wall hung fixtures at each drilling provided for this purpose.

H. Mount wall-hung fixtures at the heights indicated on the Architectural Drawings or as prescribed by local code. Special attention is called to the installation requirements of the ANSI Handicap Code.

3.02 CLEANING AND ADJUSTMENT

A. The units shall be cleaned, tested and field-adjusted to provide optimum flow and drainage.

END OF SECTION

SECTION 15771 SPLIT SYSTEM HEAT PUMP UNITS

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this Section is governed by the Mechanical General Section 15010.

B. This Section 15771 and the accompanying drawings cover the provisions of all labor, equipment, appliances and materials, and performing all operations in connection with the construction and installation of the split system heat pump units as specified herein and as shown. This work includes, but is not limited to, the following:

1. *Split system heat pump units*

2. Control system (interlocked to heat pump units)

C. Heat pumps shall be self-contained, automatic, split system heat pumps. These units shall be completely factory assembled as unitary packages complete with operating controls, internally wired and fully charged with R-410a refrigerant. Only one electrical power connection shall be required for each indoor and outdoor unit.

D. Units shall be UL listed and rated in accordance with A.R.I. Standards 240 and 270.

1.02 INTENT

A. It is the intent of this Section of the specifications to provide complete, operable, adjusted split system heat pump units, as shown and specified, which operate efficiently and automatically, and are free of excessive noise and vibration.

1.03 BASIS OF DESIGN

A. The basis of design is Trane. Any proposed substitutions shall be manufactured by Carrier or Lennox and shall be submitted in accordance with the requirements of Section 15010.

2.0 PRODUCTS

2.01 UNIT CASINGS

A. Heat pump casings shall be formed, galvanized steel construction with welded assembly. Galvanized steel surfaces shall be bonderized and painted with baked acrylic enamel for complete weather protection. Accessories such as fresh air dampers, return air dampers, and other low leak gasket dampers must match and interlock with the split system heat pumps. Indoor unit casings shall be fully insulated.

2.02 COMPRESSOR SECTION

A. Compressor section refrigeration system shall be factory charged and ready for operation. Compressor(s) shall be direct drive, 3600 RPM, hermetic reciprocating type

with centrifugal oil pump, crankcase heater and internal pressure relief valve. Compressor(s) shall have internal spring isolation and sound muffling and exhibit *minimum vibration transmission and noise.* Antirecycle timers shall be provided to prevent excessive cycling of compressors through utilization of a 5 minute time shut down of unit on interruption of power or controlled shutdown. Provide an automatic defrost system to prevent the outdoor coil from accumulating frost.

2.03 COILS

A. Indoor and outdoor coils shall be copper tubing mechanically bonded to heavy duty aluminum fins. Aluminum tubes shall not be acceptable.

2.04 ELECTRIC HEATING SECTIONS

A. Electric heating sections shall be furnished with nickel-chromium open coil resistance heating elements with each element protected by an automatic reset limit thermostat and heat limiter for both primary and secondary overcurrent/thermal protection and airflow failure switches to shut off heater in the event of a blower fan failure. Controls shall provide for multiple stage start-up and operation.

2.05 CONTROLS AND ACCESSORIES

A. All operating and safety controls must be factory installed and include solid state compressor overload protection, magnetic contactor, solenoid operated switchover valve, indoor and outdoor thermostatic expansion valve, refrigerant line drier, temperature/pressure actuated defrost control, ambient fan and compressor cycling thermostats.

B. Controls on electric heat section shall meet NEMA specifications and requirements.

C. Low voltage transformers shall be provided to accommodate the indoor thermostats and sub-bases. Each split system shall be provided with an electronic, programmable thermostat capable of performing the following energy management functions:

1. Set and maintain normal cooling temperature.
2. Set and maintain normal heating temperature.
3. Set and maintain setback and setup temperatures.
4. Set and maintain times of day and days of week during which the system operates at normal, setback and setup temperatures.
5. Set and maintain clock and day.
6. Provide automatic or manual control of the indoor fan section.
7. Provide visual indication of programmed settings, compressor status, fan status, auxiliary heat status and current mode of operation.

8. Each thermostat shall be complete with battery back-up to protect the programming in the event of power failure.

2.06 FILTERS

A. Unit shall have 1 inch low velocity glass fiber throwaway filters in commercially available sizes.

3.0 EXECUTION

3.01 INSTALLATION

A. The split system heat pump units and associated controls shall be installed in strict accordance with the manufacturer's recommendations.

B. The control system shall be completely wired under this Division 15. Wiring shall be in accordance with the N.E.C. and shall meet all requirements for this installation.

C. The controls shall be interlocked with the indoor fan section and low-voltage outside air damper motors to provide the following:

1. Shutdown of the indoor fan section through a firestat located in the return air duct prior to mixing with the outside air.

2. Closure of the outside air damper whenever the damper's associated indoor fan section is shut off.

3.02 STARTUP

A. Provide the services of a factory trained and qualified service technician employed by the unit manufacturer who shall inspect the installation including external interlock and power connections; supervise leak testing, initial operation, calibration of operating and safety controls and supervise electrical testing.

B. This service technician shall forward a report in four (4) copies to the Owner when the unit is in safe and proper operating condition. This report shall include all pressure and control settings, meg readings, voltage readings per phase during start and run, and shall list minor discrepancies to be corrected that affect safe and reliable operation. One additional copy of the report shall be left in the unit control panel. One copy of bound installation, operation, maintenance service and parts brochures, including applicable serial numbers full unit description, parts ordering sources, shall be placed in the unit control panel at the time of startup; four (4) additional copies shall be forwarded to the Owner.

END OF SECTION

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SECTION 15800 AIR DISTRIBUTION DEVICES

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this section is governed by the Mechanical General Section 15010.

B. This Section 15800 and the accompanying drawings cover the provisions of all labor, equipment, appliances and materials, and performing all operations in connection with the construction and installation of air distribution devices as specified herein and as shown. These units include, but are not limited to the following:

1. Ceiling Diffusers (CD)
2. Return Air Grilles (RAG)
3. Exhaust Registers (ER)
4. Exhaust Grilles (EG)
5. Supply Registers (SR)
6. Return Air Registers (RAR)
7. Linear Slot Diffusers (LSD)
8. Transfer Grilles (TG)

1.02 INTENT

A. It is the intent of this Section of the specifications to provide complete, operable, adjusted air distribution devices as shown and specified which are free of excessive noise, vibration and airflow fluctuations.

1.03 SELECTION CRITERIA

A. All air distribution devices shall be selected in accordance with the following minimum criteria unless otherwise noted below or on the drawings:

1. Method of mounting shall be compatible with the ceiling, wall or duct surface which it mounts on or in; i.e. lay-in, surface mounting, plaster frame, duct collar, etc. The architectural drawings shall be referenced to determine the mounting method for each device. All flanges on surface mounted devices shall be provided with a gasket.

2. Finish of all ceiling mounted devices shall be selected to match the color of the adjacent ceiling. Finish of all wall mounted devices shall be primer which is compatible with the finish coating specified for the adjacent wall; finish coat will be applied under Division 9.

1.04 BASIS OF DESIGN

A. The basis of design is Carnes. Any proposed substitutions shall be proven equal in all respects to the equipment specified as the basis of design. Any modifications to ductwork, controls, ceilings, building structure, etc., that result from any substitution shall be coordinated with all trades. This coordination shall occur before delivery of equipment and any modifications shall be performed without incurring additions to the Contract.

1.05 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are Price, Carnes, Metal Aire and Titus, provided that their units, performance, appearance and physical characteristics are equal in all respects for this specific project.

2.0 GENERAL

2.01 DESCRIPTION

A. Ceiling Diffuser (CD)

1. Ceiling diffusers shall be perforated face diffusers equipped with fully adjustable pattern controls, capable of providing one-way, two-way, two-way corner, three-way, and four-way air patterns; Carnes SPAB. Diffuser performance data shall be in accordance with ADC equipment test code 162R4. The perforated face shall be hinged for easy access to pattern controls and duct accessories. The maximum NC level at design airflow shall not exceed 35 when measured in a direct field 5'-0" from the face of the device.

B. Return Air Grilles (RAG)

1. Return air grilles shall be hollow core, perforated face, lay-in type, selected to match the CDs; Carnes SPRB. Performance data shall be in accordance with ADC 1062R4. All other characteristics shall be equal to the ceiling diffusers.

C. Exhaust Registers (ER)

1. Exhaust registers shall be surface mounted, fixed curved blade aluminum registers with blades at 0.666 to 0.750 inches on center. Provide opposed blade dampers with each ER for balancing purposes. ERs shall be Carnes RWLA sized as indicated.

D. Exhaust Grilles (EG)

1. Exhaust grilles shall be all-welded, cold rolled steel construction with 1/8" grille blades on 0.666 inch centers, 14 gauge mullions at 6" centers in an 18 gauge frame with reinforced corners; Carnes Sturdicore with 40 degree blade deflection. Finish shall be gray.

E. Supply Registers (SR)

1. Supply registers shall be surface mounted, steel, adjustable double-deflection type complete with opposed blade dampers for balancing purposes. The outermost set of deflection blades shall be parallel to the long dimension of the SR and the innermost set of deflection blades shall be parallel to the short dimension of the SR. The registers shall be tested in accordance with ADC standards and shall be selected to provide design airflow at a maximum NC of 35. SRs shall be Carnes RTDA series, sized as indicated.

F. Return Air Registers (RAR)

1. Return air registers shall be surface mounted, aluminum registers with curved hemmed edge blades with an opposed blade damper. Damper blades shall be gang operated by means of a key which can be removed after balancing. RARs shall be Carnes RNLAH (aluminum), sized as indicated.

G. Linear Slot Diffuser (LSD)

1. Supply (LSD)

a. Linear slot diffusers shall be Carnes Channelaire. Diffusers shall be of aluminum construction with one or more parallel slot(s). Each slot shall contain pattern controls, adjustable from the face of the diffuser. The same pattern controls shall function as volume controls without affecting the air discharge pattern. Each LSD shall be continuous length as indicated on the Drawings, complete with finished ends, mitered corners and splined joints. Plenums shall also be provided as indicated with all open inactive sections of the LSD covered with blank-off internal plates. Plenums shall have round collars for connection of flexible duct. Performance data shall be per ADC with a maximum NC of 35.

2. Return (LRS)

a. Linear return slots shall equal specified LSD with the following exceptions:

1) Plenums shall be lined in accordance with ul 181 and NFPA 90A.
2) Pattern controls are not required.

3. Exhaust (LES)

a. Linear exhaust slots shall equal specified LSD's with the following execeptions:

1) Plenums shall be lined in accordance with UL 181 and NFPA 90A.
2) Pattern controls shall be used for dampering only.

H. Transfer Grilles (TG)

1. Transfer grilles shall be similar to return air grilles (RAG)

3.0 EXECUTION

3.01 INSTALLATION

A. Air distribution devices shall be installed as indicated and in conformance with the manufacturer's recommendations. The color, frame and border types shall be coordinated with Architectural requirements and shall be selected to install in the finished surface indicated.

3.02 ADJUSTMENT

A. Grilles, registers and diffusers shall be tested and adjusted to provide the scheduled air flow capacities.

B. All adjustable air distribution devices located within three feet of any wall shall be set to blow directly away from, or parallel to, the wall.

C. In all slot diffuser applications, the inactive sections of the slot shall be finished with perforated steel, painted flat black, selected to match the CDs. These sections shall be open to the plenum as a return air path.

END OF SECTION

SECTION 15820 FANS

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this section is governed by the Mechanical General Section 15010.

B. This Section 15820 and the accompanying drawings cover the provision of all labor, equipment, appliances and materials, and performing all operations in connection with the construction and installation of the fans as specified herein and as shown. These fans include, but are not limited to the following:

1. Ceiling/cabinet fans

1.02 INTENT

A. It is the intent of this Section of the specifications to provide complete, operable, adjusted fans as shown and specified which are free of excessive noise, vibration and airflow fluctuations.

1.03 BASIS OF DESIGN

A. The basis of design is Cook. Any proposed substitutions shall be proven equal in all aspects to the equipment specified as the basis of design. Particular attention is called to the requirements of Section 15010.

1.04 ACCEPTABLE SUBSTITUTE MANUFACTURERS

A. Acceptable substitute manufacturers are Carnes, Cook, Acme, Penn and Greenheck.

2.0 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All non-filtered fans shall be factory tested, rated and certified in accordance with the requirements of AMCA Standard No. 210 and shall be labelled accordingly. Filtered fans may be non-labelled but must be rated in an AMCA approved laboratory in accordance with 210.

B. All roof-mounted fans shall be constructed such that water cannot enter the building through the fan regardless of whether or not the fan is operating.

C. All roof-mounted fans shall be provided complete with roof curbs. Roof curbs shall be of aluminum construction, insulated, canted and complete with wood nailer strips. Insulation shall meet NFPA 25/50 flame spread/smoke developed ratings.

D. All exhaust fans (except those utilized for grease exhaust service) shall be provided complete with gravity-type backdraft dampers.

E. All belt-drive assemblies shall be mounted on vibration isolators.

F. All motors on belt-drive assemblies shall be mounted on slide bases to provide adjustment of belt tension.

G. All belt-drives shall be rated for not less than 150% of the connected motor horsepower.

H. All belt-drives driven by a 5 HP or larger motor shall be multiple belt arrangements.

I. All belt-drives shall be adjustable to a minimum speed variation of plus or minus 20% of the design RPM.

J. All centrifugal fan wheels shall be statically and dynamically balance.

K. All electric motors and equipment shall be UL labeled.

L. Refer to Division 16 of these specifications and to the electrical contract drawings for electrical characteristics and connections to all equipment. Coordinate all electric motors and other equipment with these electrical documents.

2.02 CEILING/CABINET EXHAUST FANS

A. Ceiling/cabinet exhaust fans shall be Cook Model GEMN or an approved equal.

3.0 EXECUTION

3.01 INSTALLATION

A. Fans shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades.

3.02 ADJUSTMENT

A. The fans shall be tested and adjusted after installation to provide the capacities indicated.

END OF SECTION

SECTION 15840 DUCTWORK

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this Section is governed by the Mechanical General Section 15010.

B. This Section 15840 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the ductwork systems as specified herein and as shown. These systems include, but are not limited to, the following:

1. Supply air ductwork

2. Return, transfer and relief air ductwork

3. Exhaust ductwork

4. Outside air ductwork

1.02 INTENT

A. It is the intent of this Section of the specifications to provide a complete operable duct system as shown and specified which is reasonably airtight, free of noise, vibration and sweating, and fabricated so as to fit into the space allotted and to exhibit a minimum resistance to airflow.

1.03 DESIGN AND CONSTRUCTION

A. Ductwork shall be provided in strict accordance with the first edition - 1985 - of the SMACNA HVAC Duct Construction Standards - Metal and Flexible, NFPA No. 90A, 90B, 91 and 96, and UL 181.

B. Ductwork dimensions shown are net, clear, inside dimensions with no allowance shown for duct liner. All ductwork specified to be lined shall be 2" larger than shown in each dimension to compensate for the liner. Ductwork shall be square, rectangular, round, spiral or flat oval as noted. Conversion of duct shapes and sizes shown shall be accomplished without increasing air velocities or friction losses and is subject to prior approval by the Architect.

C. Elbows shall be either full radius type (inside radius equal to duct width), five-gore radiused flat-oval type or, in low pressure systems only, mitered with double-thickness turning vanes.

D. Abrupt changes in duct sizes and shapes shall not be permitted. The total angle of diverging transitions shall be not more than 15 degrees; converging transitions shall be not more than 30 degrees unless otherwise noted or required due to structural

constraints.

E. Offsets, transitions, rises and drops are not individually called out on the design drawings. They shall be provided as required to fit the ductwork into the allocated spaces.

F. Transition rectangular ductwork on bottom and sides. Maintain top of ductwork level and as high as possible.

G. All supply air ductwork shall be constructed for standard 1" WC static pressure class at 2500 FPM with Class C seals and is herein defined as "low pressure ductwork."

H. Grease exhaust ductwork joints shall be continuously welded and be liquid tight.

I. Provide the following types of ductwork material for the services indicated:

	TYPE OF MATERIAL	SERVICE
1.	Galvanized sheetmetal	Supply, return, exhaust and relief of comfort conditioned and outside air.
2.	Black Steel	Grease exhaust
3.	Stainless Steel	Dishwasher exhaust

2.0 PRODUCTS

2.01 GALVANIZED SHEETMETAL

A. Galvanized sheetmetal shall be lock-forming grade G90-ASTM A 525 hot dip galvanized steel sheets. Sheetmetal shall be galvanized on each side with not less than 1.25 ounces of zinc per square foot.

2.02 SPIRAL DUCT

A. Spiral duct shall be the product of United McGill Corporation, R.V. Money or an approved equal.

C. Spiral ribbed duct is not acceptable.

2.03 DAMPERS

A. Manual Volume Dampers

1. Single blade butterfly dampers are acceptable up to 12" round or 12" x 12" square. Dampers larger than these dimensions shall be multi-blade type. Single blade dampers shall be constructed of 16 gauge or heavier galvanized sheetmetal.

2. No multi-blade damper blade shall exceed 8" in width. All multiple blade dampers shall be constructed of 16 gauge galvanized steel or heavier. The damper frame shall be 16 gauge or heavier. The damper action shall be opposed-blade type.

3. Each blade shall pivot on a 1/2" cadmium plated, cold-rolled steel axle which pivots within self-lubricating, oilite bronze bearings.

4. The top and bottom edges of each rectangular damper blade shall be crimped for stiffness.

5. The operating rod for all dampers shall be extended outside the damper frame for attachment of an operator. Each operator shall have a position indicator and locking quadrant.

6. All dampers utilized for introduction of outside air shall have flexible, gasketed edge and end seals. The leakage rate shall be less than 4 CFM per sq. ft. of face area against a 1" W.G. differential pressure, based on a nominal 48" x 48" damper size.

7. Manual volume dampers shall be as manufactured by Louvers & Dampers, Inc. or an approved equal.

B. Control Dampers

1. Control dampers shall be of the same construction as manual volume dampers, except that no manual operator and quadrant is required. The operating rod shall be suitable for operation by an automatic pneumatic or electric operator.

C. Fire Dampers

1. Fire dampers shall be UL-listed and labelled for 1 1/2 hours and shall be provided with 160 degrees F. links. Dampers installed within ducts shall be Type B or Type C with the blades out of the airstream. Areas indicated shall be net, clear, open areas.

D. Smoke Dampers

1. Smoke dampers shall be UL-listed as Class 1 low-leakage smoke dampers and shall be products of Prefco.

2.04 LOW-PRESSURE DUCT BRANCHES

A. Splitter dampers shall be provided at all low-pressure ductwork branches. All low-pressure ductwork branches shall be radiused or 45 degree take-offs; straight taps are unacceptable. The length of the damper blade shall be the same as the width of the widest duct section at the split, but in no case shall blade length be less than 12". Each

operator rod shall have a locking swivel joint.

2.05 FLEXIBLE DUCT

A. Flexible ductwork shall be Class 1, UL 181 air duct and meet NFPA 90A and 90B Standards.

B. The internal duct surface shall be acoustically rated, black CPE bonded to a coated steel wire helix. The external jacket shall be a fiberglass, bi-directionally reinforced, metallized vapor barrier with a standing, triple ply seam. Fiberglass insulation shall be provided between the duct surface and the jacket to achieve a maximum thermal conductance of 0.23 BTU/Hr./sq. ft./degree F. at 75 degrees F. mean.

C. Flexible ductwork shall be suitable for 10" W.G. positive pressure and 1" W.G. negative pressure.

D. Flexible ductwork, insulation and insulation cover shall be suitable for ceiling return air plenum installation and shall comply with all applicable codes and standards regarding such ceiling plenum installations.

E. Flexible duct shall be Thermalfex M-KE or an approved equal.

F. The maximum allowable installed length of flexible ductwork shall be as follows:

1. 8'-0" on low-pressure supply air systems limited to short runouts and end of runs connected to round neck supply diffusers and registers.

2. 2'-0" on connections from round neck grilles to sheetmetal ductwork on return, exhaust and transfer ductwork.

G. Provide a spin-in fitting with integral scoop and volume damper at all flexible run-out connections in low-pressure supply air ductwork only.

2.06 FLEXIBLE CONNECTIONS

A. Provide flexible duct connections at the inlet and outlet of each belt-driven fan, indoor unit, fan coil unit, air handling unit, etc., and at all other locations indicated. Flexible connections shall be fabricated from a glass fabric coated on both sides with neoprene. Minimum weight shall be 30 oz. per sq. yard.

2.7 DUCT HARDWARE

A. Duct hardware shall be as manufactured by Young Regulator or an approved equal.

2.8 ACCESS DOORS

A. A duct access door shall be provided at each fire damper. Access doors shall be designed for 1.5 times the pressure of the duct in which they are mounted. Access doors shall be of sufficient size to provide access to the dampers for resetting the

blades and replacing the links. Where access is provided through gypsum board walls or ceilings, furnish access door for installation under Division 9. Each door shall match the fire-rating of the wall or ceiling indicated.

2.9 DUCT LINER

A. Duct liner shall be one inch thick, 1 1/2 lb. density fibrous glass with one face coated with a black fire retardant compound. The permanent composite fire and smoke hazard rating of the liner shall be stenciled on the liner face and shall be:

1. Maximum flame spread 25

2. Maximum smoke developed 50

2.10 DUCT INSULATION

A. Duct insulation shall be 2" thick, minimum 3/4 lb. density fiberglass with an FSKL 0.00035" thick aluminum foil jacket, reinforced with fiberglass scrim. Thermal conductivity shall be a maximum of K = 0.29 at 75 degrees F. mean temperature.

B. Insulation adhesive shall be Benjamin Foster 85-20. Tape shall be aluminum foil and shall be SMACNA listed and labeled.

C. The composite NFPA 90A and 90B, ASTM E84, UL rating of the installed insulation shall not exceed 25/50.

3.0 EXECUTION

3.01 INSTALLATION

A. Ductwork shall be installed in strict accordance with SMACNA, UL and NFPA standards.

B. Duct liner shall be provided for the following minimum distances or through the first elbow(s) or as otherwise indicated on the drawings, whichever is greater, downstream of each unit indicated below:

1. Fan Coil 25 feet

Duct liner shall also be provided throughout all return air, transfer and plenums.

C. Duct liner shall be cut to provide overlapped and compressed longitudinal corner joints. Liner shall be installed with the coated surface facing the air stream. Duct liner shall be adhered to the ductwork with a 100% coverage of the sheet metal surfaces using a fire retardant adhesive applied by spraying. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. The liner shall be additionally secured using metal pins welded to the duct and speed washers. All leading edges shall be secured with sheet metal airfoils.

D. All supply air ductwork located in the return air plenum which is not lined shall be All outside air ductwork shall be insulated. Insulation shall be cut slightly longer than circumference of duct to insure full thickness at corners. All insulation shall be applied with edges tightly banded. Insulation shall be adhered to duct with fire resistant adhesive. Adhesive shall be applied so that insulation conforms to duct surfaces uniformly and firmly. In addition to the adhesive, the insulation shall be additionally secured to the bottom of all ducts 18" or wider by means of welded pins and speed clips. The protruding end of the pins shall be cut off flush after the speed clips have been applied. The vapor-barrier facing shall be thoroughly sealed with tape where the pins have pierced through. All joints shall be sealed with 2" wide SMACNA tape. Any cuts or tears shall be sealed with SMACNA tape.

E. Flexible ducts utilized in the low-pressure ductwork systems shall be installed without kinks or bends which are less than a centerline radius equal to or greater than twice the diameter of the flexible duct being installed.

1. The runout size indicated on the drawings.

END OF SECTION

SECTION 15880 LOUVERS, AIR INLET AND AIR OUTLET DEVICES

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this section is governed by the Mechanical General Section 15010.

B. This Section 15880 and the accompanying drawings cover the provisions of all labor, equipment, appliances and materials, and performing all operations in connection with the fabrication, construction and installation of the louvers, air inlet and air outlet devices as specified herein and as shown.

1.02 INTENT

A. It is the intent of this Section of the specifications to provide complete, operable, finished louvers, air inlet and air outlet devices as shown and specified which are free of leaks.

1.03 BASIS OF DESIGN

A. The basis of design is as outlined for each louver and device in the 2.0 PRODUCTS subsection. Any proposed substitutions shall be proven equal in all respects to the equipment specified as the basis of design.

2.0 PRODUCTS

2.01 STORMPROOF LOUVERS

A. Louvers shall be stormproof, 4" deep, and of all-welded construction fabricated from 12 gauge extruded aluminum alloy 6063-T5. Blades shall be slanted at 45 degrees and feature an integral water baffle.

B. Louvers shall be fitted with a 1/2" mesh 16 gauge aluminum birdscreen in an aluminum frame.

C. Finish shall be Duranar Kynar 500 in a color selected by the Architect at the time of submittal review.

D. The performance standards shall be certified by the manufacturer in accordance with the AMCA Certified Ratings Program and the louver shall carry the AMCA Seal.

E. Performance Standards

1. Maximum static pressure drop at 600 FPM velocity through the free area - 0.055" W.C.

2. No water penetration at up to 540 FPM velocity through the free area.

3. Minimum free area in relation to gross overall area - 37%.

F. The basis of design is Airolite T64E. Acceptable equal manufacturers are Louvers & Dampers, Inc. and Construction Specialties.

G. Provide louver with concealed motor and linkage with motor powered to open.

3.0 EXECUTION

3.01 INSTALLATION

A. Units shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual devices to be provided with all trades.

B. All devices shall be free of leaks, provided completely finished, trimmed, adjusted, cleaned and ready for use. They shall be properly secured to the structure.

C. Insulated sheetmetal blank-offs shall be provided over all inactive sections of louvers where the architectural size exceeds the mechanical requirements.

END OF SECTION

SECTION 16010 - ELECTRICAL GENERAL

PART 1 - GENERAL

1.1 SCOPE

A. Division 16 includes all Specifications in the 16000 series and the accompanying Electrical Drawings. Provide all labor, materials and equipment, and all necessary operations to provide the complete scope of the electrical systems intended under this Division. Division 16 is not a stand alone document, but a part of the complete Project Documents.

B. Attention is called to the fact that there are many interfaces between the work required in this Division and the work required in other Divisions. Provide the necessary interface and coordination with other Divisions to provide a complete project.

1.2 CODES AND REGULATIONS

A. All work under this Division shall comply with all local building codes, laws, regulations, ordinances and the requirements of the 2005 National Electrical Code.

B. Where conflicts of installation requirements occur between the aforementioned codes, regulations or the Contract Documents, the most restrictive shall govern.

C. Obtain all permits and licenses and pay all fees required by local authorities. Arrange for all necessary inspections required by the authorities having jurisdiction and provide written certificates of approval to the project Owner or his designated representative.

1.3 DEFINITIONS

A. Contract Documents: The complete set of project Drawings and Specifications.

B. Provide: Furnish, install and connect.

C. Work: All materials installed, including all labor to provide complete system.

D. Wiring or Wired: All wire or cable installed in conduit from panelboard to equipment and connected at both ends with all required boxes, connectors, couplings, etc.

E. Conduit: Rigid steel conduit intermediate metal conduit (I.M.C.), electrical metallic tubing (EMT) plastic conduit (PVC).

1.4 DRAWINGS AND SPECIFICATIONS

A. The Drawings and Specifications together are to be considered as the Contract Documents. Any work shown in one and not shown in the other, or implied by either, shall be provided to give a complete project.

B. Should any conflicts exist between the Drawings and Specifications or there is an item shown/called for which is not clearly defined, immediately submit a request for clarification. No

additional monies will be granted later when a conflict is resolved or an item is more clearly defined.

C. The Drawings are schematic and are not intended to show the exact location outlets, etc. or the routing of conduit.

D. The exact location of equipment requiring electrical connections (mechanical equipment, elevators, lights, etc.) shall be as located by other Divisions of the Contract Documents. Refer to the Architectural, Structural and Mechanical Documents for dimensions and details of building construction and provide work described in this Division so that it conforms to the details of the project. The right is reserved to relocate any receptacle, switch or other outlet a maximum of 10'-0" before it is permanently installed without incurring additions to the Contract amount.

1.5 SITE VISIT

A. Visit the site and become familiar with all aspects of the site and existing conditions before submitting Contract price.

B. No allowance will be made for lack of knowledge of existing conditions.

1.6 DEVIATIONS

A. No deviations from the Contract Documents shall be made without the full knowledge and written consent of the Architect.

B. If the existing conditions make it desirable to modify the Contract Documents in regard to any item, provide a written request to the Architect.

PART 2 - PRODUCTS

2.1 STANDARDS FOR MATERIALS AND WORKMANSHIP

A. All materials used shall be new and shall be stamped with the label of Underwriters Laboratories, Inc. (UL).

B. All materials shall meet the standards of the following associations and institutes where applicable:

1. National Fire Protection Association (NFPA)
2. American Society of Testing Materials (ASTM)
3. American National Standards Institute (ANSI)
4. National Electrical Manufacturer's Association (NEMA)
5. Institute of Electrical and Electronic Engineers (IEEE)

C. Manufacturers names and catalog numbers specified herein are intended to describe the material and set the standard of quality. All bids shall be based on material specified. Requests for approval of material not specified shall be considered if the request is in written form and submitted to the Architect no later than fourteen (14) days before bid date. All requests shall conform with the provisions of the general and supplementary conditions.

D. Samples of materials requested to be substituted shall be furnished upon the request of the Architect.

2.2 SHOP DRAWINGS AND SUBMITTAL

A. The Engineer's review of shop drawings or submittals is a cursory review to check for general compliances of submittals with the design intent of the Contract Documents. The Engineer's review does not relieve the Contractor of his responsibility of complying with the Contract Documents. All coordination of the work in strict compliance with the Contract Documents is the sole responsibility of the Contractor.

B. The following items shall be submitted for review:

1. Conduit and wire
2. Grounding system
3. Devices
4. Coverplates
5. Metering equipment
6. Panelboards
7. Switchboards
8. Transformers
9. Fuses
10. Overcurrent devices
11. Ground fault system
12. Disconnect switches
13. Lighting fixtures
14. Lighting control system
15. Life safety system
16. Emergency system
17. Motor starters
18. Transient Voltage Surge Suppression

C. All shop drawings and submittals shall be submitted in compliance with the requirements of the general and supplementary conditions. No more than four (4) copies of submittal data will be reviewed. Any additional copies will be returned unmarked. The responsibility of copying review comments on any additional copies will rest solely with the contractor.

D. All submittals shall bear the name of the manufacturer to be used.

E. All shop drawings and submittals shall include a stamped indication signifying that the submittal has been reviewed for compliance with the Contract Documents by the Contractor. This stamped indication also represents the fact that the Contractor has checked this submittal for its interaction with all other Divisions and certifies by his signature or initials that all coordination has taken place. The stamp shall include the date, name of the Contracting Firm, the signature of the Contractor, certification of compliance and approval. This stamp shall be on the submittal before the Engineer will review it.

F. The engineer will review an individual submittal not more than twice. If the submittal is rejected again on the second review, the contractor will bare all responsibility for paying for the engineer's time for additional reviews. Such payments to the engineer shall be withheld from the next monthly pay application.

2.3 RECORD (AS-BUILT) DRAWINGS AND MAINTENANCE MANUALS

A. At job completion, submit to the Architect, a set of mylar sepias showing all deviations from the Contract Documents. The Drawings shall also have dimensions locating all underground conduits.

B. At job completion, submit to the Architect, three (3) sets of maintenance and instruction manuals for all equipment furnished on the project.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate all space requirements with all other Divisions before installing any work. Install work such that adequate space will be allotted for all other work from other Divisions to be installed and also will allow room for future access for repair and maintenance.

B. Any work installed without proper coordination shall be relocated at the Architect's direction without increasing the Contract price.

C. During the bidding process or the pricing for a guaranteed maximum price, coordinate with all other Divisions for the total amount of work required in Division 16. Any work shown or implied in another Division requiring work in Division 16 shall be included in the Contract price regardless of whether or not it is addressed in Division 16.

3.2 PROTECTION OF MATERIALS

A. All equipment shall have the original finish when the building is turned over to the Owner.

B. Protect equipment during construction from dirt, water, chemical, mechanical damage, etc. Protect all conduit openings so that no foreign material will enter the conduit.

3.3 TESTS, DEMONSTRATION AND INSTRUCTIONS

A. Test all systems described in this Division in the presence of the Owner or a designated representative upon completion of the work. Demonstrate that the installation is in accordance with Contract Documents.D

B. Any work found not to be in compliance with the Contract Documents shall be repaired or replaced without incurring any additions to the Contract price.

C. Provide to the Owner, all instruction on maintenance and operation of all systems and equipment provided under this Division. Provide all necessary tools and personnel to thoroughly present these instructions.

END OF SECTION 16010

SECTION 16100 - ELECTRICAL BASIC MATERIALS & METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

A. All work specified in this Section shall comply with the provisions of Section 16010.

B. This Section describes the basic electrical materials and installation methods that are acceptable and applicable to Division 16.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Galvanized rigid steel conduit shall be low carbon, hot-dipped galvanized both inside and out with threaded joints.

B. Intermediate metal conduit (IMC) shall be steel, galvanized both inside and out with threaded joints.

C. Electrical metallic tubing (EMT) shall be steel, galvanized both inside and out.

D. Plastic conduit (PVC) shall be schedule 40 PVC heavy wall type. A grounding conductor shall be provided.

E. Flexible metal conduit shall be flexible steel conduit tubing and shall meet Underwriters Laboratories Standard for Flexible Steel Conduit.

F. Liquid-tight flexible metal conduit and liquid-tight non-metallic conduits shall be liquid-tight and sunlight resistant.

G. Steel conduit approved manufacturers are Allied, Triangle and Republic.

H. PVC conduit approved manufacturers are Carlon and Triangle.

2.2 CONDUIT FITTINGS

A. Rigid conduit and IMC conduit fittings shall be zinc-coated, ferrous metal and taper threaded type.

B. EMT fittings shall be zinc-coated steel and hexnut compression or set-screw type. EMT connectors shall have insulated throats.

C. PVC fittings, elbows and cement shall be produced by the same manufacturer. All joints shall be solvent welded in accordance with the manufacturer's recommendations.

D. Conduit connections to switchboards, motor control centers, transformers, panel cabinets, and pull boxes shall have grounding wedge lugs between the bushing and the box or locknuts designed to bite into the metal.

E. Each conduit end shall be provided with either an insulated throat connector or separate locknut and insulated bushing. Bushing shall be installed before any wire is pulled.

F. Conduit fittings approved manufacturers are Raco, Steel City, O.Z. Gedney, Thomas & Betts and Appleton.

G. Expansion fittings shall be provided in all conduit which crosses and expansion joint.

2.3 CONDUCTORS

A. Conductors shall be copper of 98% conductivity, 600 volt insulation. Sizes specified are AWG gauge for No. 4/0 and smaller and circular mils (MCM) for all sizes larger than no. 4/0. Conductors No. 10 and smaller shall be solid and type "THHN" or "THWN" insulation. No. 8 and larger shall be stranded and type "THW" or "XHHW" insulation. Aluminum conductors may be used for service lateral conductor if the same or larger capacity of the conductors specified. Aluminum conductors shall be Alcan 8000 series, Stabiloy or approved equal.

2.4 OUTLETS

A. Outlet boxes and covers shall be of such form and dimensions as to be adapted to their specified usage, locations, size and quantity of conduit, and size and quantity of conductors entering the boxes. In special "Fire Rated" partitions, outlets shall comply with ASTM No. E119.

B. Flush ceiling outlets for surface or pendant mounted lighting fixtures shall be one-piece 4" square or octagonal pressed steel boxes. Boxes for devices in unfinished masonry walls or stud walls shall be pressed steel, square corner, sectional switch boxes, or shall be 4" square box with a square cornered tile wall cover, set flush with masonry construction. Boxes in concrete ceiling slab shall be octagonal, shallow concrete boxes. Welded boxes are not acceptable.

C. All outlet boxes in plaster or masonry walls or ceiling shall be provided with plaster rings.

D. Junction boxes and all outlets not indicated as containing wiring devices or lighting fixtures shall have covers. Covers for outlets in walls shall be as specified for wall switches and receptacles.

E. Outlet boxes exposed to the weather and outlet boxes for vaportight lighting fixtures and devices shall be of cast iron corrosion resistant type.

F. Outlet box approved manufacturers are Appleton, Raco, Steel City or Crouse-Hinds.

2.5 DISCONNECT SWITCHES

A. Disconnect switches shall be "heavy-duty" type, enclosed switches of quick-make, quick-break construction. Switches shall be horsepower rated for 600 volts AC as required. Lugs shall be UL listed for copper and aluminum.

B. Padlocking provisions shall be provided for padlocking in the OFF position.

C. Switches shall be furnished in NEMA I General purpose enclosure unless noted otherwise. Switches located on the exterior of the building or in "wet" locations shall have NEMA 3R enclosures.

D. Fused disconnect switches shall have rejection type fuse clips with dual element, current limiting fuses of rating shown.

E. Disconnect switches shall be mounted to structure. Disconnect switches shall not be mounted to mechanical equipment or ductwork.

2.6 NAMEPLATES

A. Nameplates shall have 3/8" high engraved letters.

B. 120 or 208 volts: white core laminated bakelite with black finish.

2.7 WALL SWITCHES

A. Wall switches shall be plastic, totally enclosed, quiet type, self-grounding, 120 volts and 20A rating and shall match existing if possible and equal the following:

Single Pole: Hubbell No. CS1221, or equal by Leviton, P&S or Cooper.

Double Pole: Hubbell No. CS1222, or equal by Leviton, P&S or Cooper.

Three-Way: Hubbell No. CS1223, or equal by Leviton, P&S or Cooper.

Four-Way: Hubbell No. CS1224, or equal by Leviton, P&S or Cooper.

B. Color shall be as selected by architect.

C. Flush motor switches with red pilot light and with overload protection for fractional horsepower motors shall be Hubbell No. HBL1221PL.

D. Key switches shall be Hubbell No. HBL1221L 20A Series or approved equal by P&S or Leviton.

2.8 WALL MOUNTED OCCUPANCY SWITCHES

A. The passive infrared sensor shall be a completely self-contained control system that replaces a standard toggle switch. Sensor shall have ground wire for safety. Switching mechanism shall be a latching air gap relay, compatible with electronic ballasts, compact fluorescent, and inductive loads. Triac and other harmonic generating devices shall not be allowed.

B. Sensor shall cover up to 1000 sq. ft. for walking motion, with a field of view of 180 degrees.

C. Sensor shall have system which provides superior 180 degree coverage.

D. Sensor shall operate at 120 VAC.

E. Sensor shall have no minimum load requirement and shall be capable of switching from 0 to 500 watt incandescent; 0 to 800 watts fluorescent or 1/6 hp @ 120 VAC, 60 Hz; and 0 to 1200 watts fluorescent or 1/3 hp @ 120 VAC, 60 Hz.

F. For accuracy and consistency, sensor shall have a DIP switch controlled, digital time delay adjustable from 15 seconds to 30 minutes.

G. Sensor shall have standard 5 year warranty and shall be UL and CUL listed.

H. Sensor shall be Wattstopper WI Series, Leviton Decora Series or approved equal by engineer.

2.9 RECEPTACLES

A. Duplex receptacles shall be plastic, two-pole, three wire, self-grounding, side wired, 125 volts and 15A rating and shall match existing if possible and be equal to the following: Duplex receptacles shall be Hubbell No. CR5262 Series, or equal by Leviton, P&S or Cooper. Isolated ground type shall be Hubbell No. CR5252IG Series, or equal by Leviton, P&S or Cooper.

B. Single receptacles shall be two-pole, three wire, self-grounding, side wired, 125 volts and 20A rating and shall be equal to the following: Single receptacles shall be Hubbell No. HBL5361 Series, or equal by Leviton, P&S or Cooper. Isolated ground type to be Hubbell No. IG-5361 Series, or equal by Leviton, P&S or Cooper.

C. Ground fault circuit interrupt (GFI) receptacles shall be Hubbell GFR5352, or equal by P&S, Leviton or Cooper.

D. Color shall be as selected by the Architect.

2.10 COVERPLATES

A. Coverplates for flush mounted devices shall be brushed finished stainless steel standard size, Hubbell "P" Series or equal by Leviton, P&S or Cooper.

B. Telephone outlet coverplates shall have same finish as above and have a bushed hole in the center.

C. Coverplates for exterior devices shall be self-closing, die cast aluminum Hubbell WP8M or equal by Leviton, P&S or Cooper.

2.11 PLYWOOD BACKBOARDS

A. Provide plywood backboards where shown. Backboards shall be minimum 3/4" thick and sized as shown or to accommodate equipment indicated to be mounted thereon.

B. Secure plywood to the building structure and paint with two coats of gray paint.

2.12 SMOKE AND FIRE STOP FITTINGS

A. Smoke and Fire Stop Fittings shall be UL listed for that purpose. The fittings used to seal conduit either on the outside of the conduit, busway or cable or internally shall have heat

activated intumescent material, which expands to fill all voids. Smoke and fire stop fittings shall be O.Z./Gedney "FIRE-SEAL" or Dow Corning silicone RTV foam with an hourly fire-rating equal to or higher than the rating of the floor, ceiling or wall through which the cable or conduit passes. The seals for conduit shall be of the flanged type.

2.13 FUSES

A. Provide all fuses. All fuses shall be of the same manufacturer. All fuses shall be of the high interrupting rating (200,000 Amps), current limiting type and manufactured by Bussmann. Fuses shall be provided for each fuse cutout and the specified quantity of fuses shall be furnished for spares.

B. Circuits 0 to 600 ampere shall be protected by rejection type, current limiting BUSSMANN LOWPEAK Dual Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). All dual-element fuses shall have separate overload and short-circuit clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and be listed by Underwriter's Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class RK-1.

C. Circuits 601 to 6000 ampere shall be protected by current limiting BUSSMANN HI-CAP Time-Delay Fuses KRP-C. Fuses shall employ "O" rings as positive seals between the end bells and the glass melamine fuse barrel. The terminals shall be opened. Fuses shall be time-delay and must hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in 0.1 seconds or less and be listed by Underwriter's Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class L.

D. Furnish and turn over to the Owner a minimum of one (1) set of spare fuses (set consisting of three fuses) for each type and rating of fuse used. When the number of fuse sets of the same type and rating actually installed exceeds five (5) sets, furnish an additional spare set of fuses for each five (5) or fraction thereof.

E. Provide a cabinet in which to store all spare fuses, Bussman Catalog No. SFC

F. Acceptable manufacturers are Bussman or equal by Littlefuse.

PART 3 - EXECUTION

3.1 CONDUIT

A. Rigid steel (or IMC) shall be used for service entrance and all feeders and branch circuits where exposed to damage.

B. EMT shall be used for branch circuits, fire alarm and telephone when not underground or in concrete in contact with the earth.

C. Schedule 40 PVC may be used for all underground feeders, service entrance conductors when encased in 4" of concrete on all sides, or under the lowest floor slab.

D. Conduit shall be continuous from outlet to outlet, from outlet to cabinet, junction box and pull box. Conduit shall enter and be secured to all boxes, etc., in such a manner that each system will be electrically continuous from service to all outlets such that a good ground is provided. All

conduit from cabinets and junction boxes shall terminate in approved outlet boxes or conduit fittings. Conduit connections to any box which has no threaded hub shall be double locknutted.

E. Provide junction boxes or pull boxes where shown and where necessary to avoid excessive runs or too many bends between outlets. The conduit sizes shown may increase if desired to facilitate the pulling of cables.

F. All conduit shall be concealed unless indicated otherwise. Install exposed conduit parallel with or at right angles to the building walls and support from walls or ceilings at intervals required by Code with approved galvanized iron clamps or hangers. Concealed conduit above the ceiling shall be supported independent of ceiling construction. Where ceilings of lay-in type are used, conduit must be installed high enough to permit removal of ceiling panels and lighting fixtures. Use threaded rods and hangers for supporting single conduit. Use trapeze hangers consisting of double-nutted threaded rods and "Unistrut" channels or angles of 12 gauge minimum steel for supporting multiple conduit.

G. Minimum size conduit for branch circuits shall not be smaller than 1/2". Home runs shall extend from outlets shown to panel designated. Home runs shown shall not be combined. Home run conduit shall not be smaller than 3/4".

H. At couplings, conduit ends shall be threaded so that they meet in the coupling. Right and left hand couplings shall not be used; conduit couplings of the Erikson Type shall be used at locations requiring such joints.

I. All conduit for future use, for telephone wire, or for data communication cable, shall be left with No. 26 gauge wire pulled in them or a pull line as manufactured by Ideal, and the ends securely corked or capped.

J. Expansion fittings shall be installed in all conduit which pass through the cross-sectional area of expansion joints.

K. Provide non-hardening elastic type duct seal compound, Neer No. DC., 3M Co. "Scotchfil", or Gardner Bender duct seal, for each conduit entering the building from outside and for each conduit passing from one space into another which is normally at a lower temperature.

L. Provide watertight conduit hubs on conduit terminating in a box or cabinet exposed to the weather.

M. Space in sleeves or around conduit that pass through fire resistive or fire rated walls, partitions, floors or ceilings shall be closed by packing with an unlabelled fire resistive material that will maintain the rating of the barrier penetrated.

3.2 FLEXIBLE CONDUIT

A. PVC extruded cover flexible conduit shall be used in making short flexible connections to rotating or vibrating machinery or equipment. The flexible conduit at these locations shall be as short as possible, but shall have a minimum length of 12".

B. A green stranded bonding jumper shall be installed outside of all flexible conduit that extends directly from a non-flex conduit to a rotating or vibrating machine. Where a junction box is used, the green stranded bonding jumper shall be installed inside the flexible conduit and attached to the junction box and to the machine. When the bonding jumper is installed outside of the

flexible conduit, plastic wire straps shall be used 6" o.c. to secure the jumper to the flexible conduit.

C. Flexible metal (MC) conduit system may be utilized above walls. MC Cable shall run from point of exit from wall or millwork. MC cable shall be permitted to be installed in the ceiling space. Conductor colors of the MC cable shall comply with 26100 3.04 C

3.3 CONDUIT PROTECTION

A. All conduit installed in the ground outside the building exterior line (with the exception of exterior lighting circuits) shall be encased in 4" of concrete on all sides. Concrete shall be a minimum of 3000 P.S.I. mix. All threaded joints in rigid conduit that is encased in concrete shall have a U.L. listed joint compound applied. All conduit installed outside the building underground shall be buried a minimum of 30" below finished grade but in no case shall be buried deeper than 48". Where conduit is installed below the ground floor slab inside the building exterior line, the conduit shall be run between the floor slab and the vapor barrier. These conduits shall be installed in the slab itself where feasible. When a conduit duct bank must be installed then the entire duct bank shall be encased in concrete and installed per Appendix B of the NEC. Derating of conductors in the underslab duct bank shall be the responsibility of the contractor. Conduit installed in any slab, where permitted above, shall be above the bottom steel and below the top steel.

B. Conduit shall be secured in place and protected where necessary to prevent damage to work during construction. The ends of all conduit shall be plugged to avoid filling with any foreign matter. All conduit shall be blown out and swabbed clear of water and trash prior to pulling wire.

C. Provide identifying marker tape the entire length of each conduit installed in the ground outside the building. The tape shall be constructed of inert polyethylene, resistant to acids, alkalis, etc., in the soil, and shall be a minimum 4 mil thickness. The tape shall be yellow, 6" wide, and shall have the words, "CAUTION - ELECTRIC LINE BURIED BELOW," imprinted with contrasting permanent ink. The imprint shall repeat itself for the entire length of the tape. The tape shall be buried at a maximum of 18" below finished grade, above a portion of the earth fill shall be "Terra Tape" as manufactured by Reef Industries, Inc., P.O. Box 33248, Houston, Texas 77033 (1-800-231-6074).

3.4 WIRING

A. All conductors shall be installed in conduit. No conductors shall be pulled into the conduit until the conduit system is complete and plaster had dried. Wire pulling lubricants shall be Gardner-Bender "Wireaide" or Ideal "Yellow 77".

B. Conductors shall be continuous from outlet to outlet and from outlet to junction box or pull box. All splices and joints shall be carefully and securely made to be mechanically and electrically solid with pressure type connectors, Gardner Bender "Winggard" or Ideal "Wingnut". Tape shall be "Scotch" No. 33 for indoor and No. 88 for outdoor or Gardner Bender No. 95-661. Where connection is made to any terminals of more than 30 amperes capacity and where conductors larger than No. 10 are connected to any terminal, copper terminal lugs shall be bolted to the conductors. Where multiple connections are made to the same terminal, individual lugs for each conductor shall be used. Aluminum conductors, if used for service conductors, shall be made with high compression lugs as manufactured by Square D, Ideal or MAC.

C. Each conduit shall have a minimum of two (2) conductors pulled in unless that particular conduit is noted as being for systems other than electrical circuitry and/or future use or unless noted otherwise.

D. Conductors for lighting and receptacle circuits shall have color coded jackets. The wiring shall be color coded with the same color used with its respective phase through the entire job as follows:

208/120 Volt System

Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green

E. The feeder and service entrance conductors shall be color coded by the use of colored plastic tape applied within 6" of each conductor end.

F. Branch circuit conductors shall not be smaller than No. 12 and where the home run from center of load exceeds 100'-0", the conductors from home run outlet to panel shall be No. 10 minimum.

G. For branch circuits terminating in outlet without device, leave minimum of 12" of slack wire coiled for connection of equipment. All conductors shall be identified with proper circuit numbers at terminals, junction boxes at panelboards within 6" of conductor ends.

3.5 OUTLETS

A. Provide galvanized steel or cast type boxes for all outlets.

B. Where outlet boxes are used to support lighting fixtures, the outlet box shall be anchored to the structural members of the building per NEC 370-13.

C. Outlet boxes shall be flush mounted unless they are specifically shown as being used with exposed conduit or are located above a ceiling.

D. Where outlets are supplied from conduit run in or below floor slabs, the conduit shall be stubbed up at the location shown and the wall built up around the conduit.

E. Cuts for outlet boxes in masonry walls shall be made so that the coverplate will completely cover the cut. The mounting height of switch, receptacle and other outlets may be varied slightly, with the Architects approvals, so that the outlet box, top or bottom, will occur at a masonry joint.

F. The edge of all outlet boxes shall be flush with the surface in which they are recessed. The devices that fit into the outlet boxes shall be screwed tight before the coverplate is installed and the coverplate shall not be used as a means of tightening the devices in place.

G. Where outlets are shown as being adjacent and different mounting heights are specified for each, they shall be mounted one directly over the other, on the centerline of the group.

3.6 NAMEPLATES

A. Provide specified nameplates on the main switchboard, distribution panels, feeder switches, feeder breakers, panelboards motor control centers, disconnect switches, contactors, starters, transformers, start-stop push buttons and motor switches.

B. Provide nameplates on every device in the main switchboard, distribution panels and motor control centers.

C. Nameplates for surface mounted equipment shall be installed on the exterior of equipment with sheetmetal screws. Nameplates for flush or recessed mounted equipment shall be installed on the inside of the panel door or cover with epoxy cement.

3.7 WALL SWITCHES AND RECEPTACLES

A. Where more than one device is indicated at a location, the devices shall be gang-mounted in combined multi-gang boxes and covered jointly by a common coverplate. Provide barriers as required by the devices and voltages being used.

3.8 COVERPLATES

A. All junction boxes, outlet boxes, multi-gang switch boxes, utility boxes, etc., shall be covered with a coverplate. The coverplate shall be a finished plate as specified unless designated otherwise.

B. Coverplates shall be mounted vertically unless designated otherwise.

3.9 GROUNDING

A. Ground connections shall be in accordance with the 2005 National Electrical Code.

1. Provide a grounding electrode system consisting of a minimum of three (3) copperweld rods, 3/4" x 10'-0", driven 24" below grade a minimum of 72" apart in the form of an equilateral triangle, bonded together with No. 4/0 conductors. Install rods a minimum of 36" clear of foundation walls to effect the building ground. If the resistance to ground exceeds 25 ohms, additional rods shall be driven and bonded together until a reading of 25 ohms or less to ground is obtained. After completion of the grounding system, measure the system ground resistance with a "Megger Earth Tester". Submit directly to the Architect two (2) copies of each test report certified by the testing technician and the Owner's representative.

2. Extend from the electrodes to the main service disconnect with a No. 4/0 copper insulated ground conductor in a 1" conduit and connect to the neutral bar, housing and frame.

3. Provide a No. 4/0 copper insulated conductor across the water meter with the conductor attached with clamps to the water line on each side of the meter.

4. Provide a No. 4/0 copper insulated ground conductor in a 1" conduit from cold water entrance pipe ahead of first valve to the main service disconnect and connect to the neutral bar, housing and frame.

5. Where nonmetallic insulating couplings or dielectric flanges are used in metallic water piping systems, provide a No. 4/0 copper, insulated ground conductor across the couplings with the conductor attached with clamps to the water line on each side of the coupling.

6. All ground connections in the building system ground shall be done with Cadwell.

7. All ground clamps shall be equipped with compression type cable lugs independent of the compression device clamping the pipe or rod.

8. All steel conduit entering the main service disconnect shall have threaded conduit insulated grounding bushings. All bushings shall be bonded together and bonded to the main grounding bus with a No. 4 bare conductor.

B. Provide an insulated green bonding jumper from the grounding lug of all receptacles to a Steel City "GEE" clip or a sheet metal screw in the outlet box. The ground wire installed behind the device mounting screws will not be acceptable.

C. Provide 1 #6-3/4" conduit from the system ground to the telephone company main distribution frame or service cabinet and to each telephone backboard.

3.10 TELEPHONE CONDUIT SYSTEM

A. Telephone service shall include wood backboards and equipment cabinets with service entrance conduit as shown.

B. Telephone service entrance cable, all branch cabling and telephone instruments shall be provided by the telephone equipment vendor.

C. Provide an outlet and conduit system for the telephones as shown and leave the same in readiness for wiring by others. Provide pull line in all telephone conduit. Terminate all conduit at a uniform height with smooth insulated bushings at the telephone wood backboards.

D. Telephone wall outlets shall be pressed steel sectional switch boxes, wall mounted at the locations indicated. Coverplate shall have a bushed hole.

E. Telephone floor outlets shall be floor boxes as specified at the locations indicated.

3.11 CONNECTION TO EQUIPMENT

A. Equipment furnished by the Owner or under other Sections, such as mechanical equipment, elevators, escalators, signs, kitchen equipment, etc., will be installed by others. Provide electrical service and make the electrical circuit connection to this equipment.

B. Provide PVC insulated flexible cord sets for all cord and plug connected building appliances and equipment. Cords shall be sized in accordance with electrical circuits indicated. Multiple conductor cords shall be "SO" cable with PVC jacket and green insulated ground conductor.

3.12 CORING, CUTTING AND PATCHING

A. Set sleeves for conduit accurately before the concrete floors are poured, or set boxes on the forms so as to leave openings in the floors in which the required sleeves can be subsequently located. Fill in the voids around the sleeves with concrete.

B. Should the performance of this preliminary work be neglected and should cutting be required in order to install conduit, then the expense of the cutting and restoring of surfaces to their original conditions shall be accomplished without incurring additions to the Contract.

3.13 EQUIPMENT ANCHORING

A. All items of electrical equipment, such as switchboards, motor control centers, transformers, standby generator, etc., shall be securely anchored to the building structure. The anchoring shall be accomplished by utilizing a minimum size of 3/8" steel anchor bolts in the structure and to the item of equipment. A minimum of two (2) anchor bolts shall be provided on each side of each item of equipment with the following exceptions:

Exception No. 1: If the equipment manufacturer includes more than two (2) anchor holes per side in the base or base frame of the equipment item, then there shall be one anchor for each anchor hole.

Exception No. 2: If the equipment manufacturer recommends a particular quantity greater than two (2) per side, then that quantity of anchors shall be provided.

END OF SECTION 16100

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SECTION 16200 – SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. All work specified in this Section shall comply with the provisions of Section 16010.

B. Provide a complete electrical distribution system. The system shall include the service entrance, main switchboard, feeders, transformers, distribution panels, panelboards, busway, remote control switches, contactors, etc., to provide a complete system.

C. All distribution switchgear (branch circuit panelboards, switchboard, distribution panelboards, transformers, busway, etc.) shall be the unit responsibility of one manufacturer. All component parts of the above listed items shall be of the same manufacturer except where a written request for deviation from this requirement has been approved prior to bid date.

D. Shop drawings for equipment specified in this Section shall show that all specified requirements have been incorporated.

E. All floor mounted distribution equipment shall be mounted on a 4" high concrete pad.

1.2 ELECTRICAL SERVICE

A. Make all arrangements with the power company and pay all charges made by the power company for permanent electric service. In the event that the power company's charges are not available at the time the project is bid, the bids shall be qualified to notify the Owner that such charges are not included.

B. The power company will provide the underground primary service and the pad mounted transformer.

C. Provide the pad for the pad-mounted transformer in accordance with the power company specification.

D. The Secondary Service from the power company transformer to the main distribution panelboard is sized for utilization of copper conduit.

1.3 METERING

A. Metering equipment will be by the power company. The power company will furnish the meter cabinet for installation at a location as directed by the power company and as detailed at the pad-mounted transformer.

PART 2 - PRODUCTS

2.1 BRANCH CIRCUIT PANELBOARDS

A. Panelboards (panels) shall be general purpose enclosures and shall be surface or flush mounted as indicated. Panels shall be of the automatic circuit breaker type, factory assembled by the manufacturer of the circuit breakers. Panels shall be for the voltage indicated with the quantity of poles and ampacity of circuit breakers shown.

B. Boxes and trim shall be made from code gauge steel. Boxes shall be sufficient size to provide a minimum gutter space of 4" on all sides. Boxes shall be minimum 20" width and 5 3/4" depth.

C. Hinged door covering all device handles shall be included in all panel trim. Doors shall have flush-type cylinder lock and catch, except that doors over 48" in height shall have auxiliary fasteners at top and bottom of door in addition to flush-type cylinder lock and catch. Door hinges shall be concealed. All locks shall be keyed alike. Directory frame and card having a transparent cover shall be furnished each panel door.

D. Trims for flush panels shall overlap the box by at least 3/4" all around. Surface trims shall have the same width and height as the box. Trims shall be mountable by a screwdriver without the need for special tools. After installation, trim mounting mechanism or hardware shall not be accessible when panel door is closed and locked.

E. All exterior and interior steel surfaces of the trim shall be cleaned and finished with gray paint over a rust-inhibiting phosphatized coating.

F. All interiors shall be completely factory assembled with protective devices, wire connectors, etc. All wire connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper or aluminum wire.

G. Interiors shall be so designed that devices can be replaced without disturbing adjacent units and without removing the main bus connectors, and shall be so designed that devices may be changed without machining, drilling or tapping.

H. Bus bars for the mains shall be of copper sized in accordance with U.L. standards. Full size bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices.

I. Phase bussing shall be full height without reduction. Cross and center connectors shall be of the same material as the bus.

J. The neutral bus shall utilize setscrews to bond the neutral wire to the neutral bus through holes drilled in the neutral bar. A sheet copper neutral bus utilizing flathead screws to hold the neutral wires will not be acceptable.

K. Spaces for future devices shall be included as indicated and shall be bussed for the maximum rated device that can be fitted into them.

L. All circuit breakers shall be manually operated, thermal-magnetic, automatic, of the ampacity and poles as indicated. They shall be quick-make, quick-break, both on manual and automatic operation. Breakers shall be over-the-center toggle operating type, with the handle going to a position between ON and OFF to indicate automatic tripping. All multi-pole breakers shall have internal common trip. Breakers shall have a minimum of 10,000 RMS symmetrical amperes interrupting capacity unless designated otherwise. The breakers furnished shall be determined by the specifications and by the minimum U.L. labeled RMS symmetrical amperes interrupting capacity at circuit voltage. All circuit breakers shall be bolted on and rigidly braced.

M. Panels having sub-feed lugs for feeding through shall have 8" minimum extra gutter space at the lug end and on one side.

N. Each panel as a complete unit shall have a short-circuit current rating equal to or greater than the equipment rating indicated.

O. Panels shall be as manufactured by General Electric, Square D, or Cutler-Hammer.

2.2 DISTRIBUTION PANELBOARDS

A. Distribution panelboards (panels) shall be of the circuit breaker type, factory assembled by the manufacturer of the circuit breakers, complete with front door cover. The main breaker and the branch circuit breakers shall be as indicated. The main bus shall be 98% conductivity silver plated copper, rated as and of capacity equal to or greater than the rating or setting of the over-current protective device next back in the line. Panel shall be suitable for the voltage and phase indicated. Provide 25% ground bus.

B. Panels shall be flush or surface mounted as indicated, with baked-on enamel trim, adjustable trim clamps and door with chromium plated combination cylinder lock and catch, all locks keyed alike. Provide a specified nameplate for each device and a blank (not engraved) nameplate for each spare breaker or space.

C. The neutral bus shall utilize setscrews to bond the neutral bus through holes drilled in the neutral bar. A sheet copper neutral bus utilizing flathead screws to hold the neutral wires will not be acceptable.

D. All circuit breakers shall be manually operated, thermal-magnetic, automatic, of the ampacity and poles as indicated. They shall be quick-make, quick-break both on manual and on automatic operation. Breakers shall be over-the-center toggle operating type, with the handle going to a position between "ON" and "OFF" to indicate automatic tripping. All multi-pole breakers shall have internal common trip.

E. The interrupting capacity of the breakers furnished shall be 10,000 RMS symmetrical unless indicated otherwise.

F. All main circuit breakers shall be molded case and vertically mounted. All vertically mounted molded case circuit breakers shall be mounted so that the handle is up for "ON" and down for "OFF", when viewed from the normal standing position. All vertically mounted molded case main circuit breakers shall be UL approved for feeding in the bottom and out the top.

G. All circuit breakers, including any connectors to the main bus, shall be bolted and rigidly braced.

H. Spaces for future installation of molded case circuit breakers are specifically by range of trip rather than a single trip size or frame size. The spaces so scheduled shall be complete with all bus and required bus connectors such that future breakers can be installed without adding or changing bus connectors on the main bus and without using a larger (frame size) or more expensive breaker than the trip size and interrupting capacity would require. If the bus connectors furnished on the main bus will not cover the trip range specified, then duplicate sets of connectors shall be furnished on the main bus for each frame size required.

I. Distribution panels shall be as manufactured by General Electric, Square D, or Cutler-Hammer.

2.3 SINGLE PHASE PROTECTION

A. Provide Taylor Electronics Model #PND-3, 6, 9, 12 ADJ-REM LED's, or equal, single phase relay behind hinged panel in switchboard. Provide green and amber LED's on a plug in cable for mounting on face of switchboard. Provide snap on lenses and labels identifying the green LED as "SYSTEM NORMAL" and the amber LED as "SINGLE PHASE CONDITION".

B. Provide shunt trip coils on all main devices, operated by the phase failure relay.

C. Provide capacitive trip unit to guarantee relay and shunt trip operation during a single phase occurrence.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide a typewritten directory under plastic for all panelboards with spares marked in pencil.

B. Provide all necessary hardware to level and secure the switchgear as required by the manufacturer's instructions. Make all electrical connections for supply and load circuits and leave in operating condition.

C. Clean enclosure of all switchgear of all foreign matter, including dust.

D. Remove all rust marks and repaint to leave switchgear in new condition.

3.2 STUDIES

A. Provide a complete short circuit and coordination study for the actual switchgear manufacturer provided from the service entrance to all end devices.

END OF SECTION 16200

SECTION 16300 – LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. All work specified in this Section shall comply with the provisions of Section 16010.

B. Provide all lighting fixtures and lamps as specified herein and as shown.

C. All lamps shall be operating at the time of the final inspection and for a period of six (6) months after the final acceptance of the project by the Owner.

D. Confirm exact locations of all lighting fixtures by coordination with the Architects Reflected Ceiling Plans and mechanical equipment above or on the ceiling.

E. Confirm all ceiling types before ordering lighting fixtures.

F. Each lighting fixture shall have been tested and certified for proper operation by the fixture manufacturer for the type mounting and ceiling on/in, which it is installed.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

A. Each lighting fixture shall be as specified in the Lighting Fixture Schedule corresponding with its fixture type indication (letter).

B. Most lighting outlets are lettered or groups of outlets are indicated by a letter.

C. Each lighting fixture shall have a manufacturer's label affixed and shall comply with the requirements of all authorities having jurisdiction.

D. The lighting fixtures that are indicated by the letters shall be as indicated on the Lighting Fixture Schedule.

2.2 LAMPS

A. The type lamps shall be as specified for each lighting fixture in the lighting fixture schedule.

B. The lamp catalog number is the catalog number is generally for Sylvania Lighting and is given as a standard of the quality and performance required. Equal lamps by General Electric or Philips will be acceptable. When a lamp manufacturer's name is used along with the catalog number in the lighting fixture schedule, it is considered unequaled by any other lamp and shall not be substituted for. The lamp performance with energy conserving ballasts furnished under this Section shall be certified by a nationally recognized independent testing laboratory.

C. Fluorescent lamps shall be as specified in the Lighting Fixture Schedule.

D. Incandescent lamps shall be as specified in Lighting Fixture Schedule.

E. All incandescent lamps, except quartz tubes, shall be rated for 130 volt operation.

F. High Intensity Discharge (HID) lamps shall be as specified in the Lighting Fixture Schedule.

2.3 BALLASTS

A. Fluorescent ballast shall be electronic type manufactured by Motorola, Magnetek or Advance.

B. Ballast shall operate lamps at a frequency or 25 KHz or higher with less than 2% lamp flicker.

C. Ballast shall operate at an input voltage of 108 - 132 Vac (120V line) at an input frequency of 60 Hz. Light output shall remain constant for line voltage fluctuation of ± 5%.

D. Ballast shall comply with EMI and RFI limits set by the FCC (CFR 47 part 18) for non-residential applications and not interfere with normal electrical equipment.

E. Ballast shall withstand transients as specified by ANSI C.62.41 for location category A3 in the normal mode and location category A1 in the common mode.

F. Ballast shall meet applicable ANSI standards.

G. Ballast shall have a minimum power factor of 0.99.

H. Ballast shall not be potted or weigh more than 1.3 pounds.

I. Ballast shall have less than 10% Total Harmonic Distortion.

J. Ballast shall have less than 6% Third Harmonic Distortion.

K. Ballast height shall be less than or equal to 1.5 inches.

L. Ballast shall have a poke-in wiretrap connector.

M. Ballast shall meet sound rating "A".

N. Ballast must be Underwriters Laboratories (UL) listed Class P, Type 1 Outdoor.

O. Ballast shall provide normal rated lamp life as stated by lamp manufacturers.

P. Rapid start ballast are series wired and shall maintain full cathode heat during operation.

Q. Rapid start ballast shall have less than a 1.5 Lamp Current Crest Factor (LCCF) and instant start ballasts have less than a 1.7 LCCF.

R. Instant start ballast shall have parallel lamp operation.

S. Ballast factor standard is .875±0.025 on all normal light output products.

T. Ballasts for "PL" fluorescent lamps shall be coordinated with lamps and 2-pin or 4-pin configuration ballasts shall be provided to match lamps. Manufacturer for "PL" fluorescent fixtures shall be Advance, Roberson, Lightolier or Lutron.

U. Ballasts for High Intensity Discharge (HID) lamps shall be Constant Wattage Autotransformer (CWA) type or equal type with minimum power factor of 0.9.

2.4 DIFFUSERS

A. Unless specified otherwise, all prismatic diffusers for fluorescent lighting fixtures shall be prismatic acrylic KSH K12 with a thickness of 0.125", measured from the back side to the peak of the prism.

B. All wraparound lenses shall be virgin acrylic, one-piece and injection molded.

2.5 EMERGENCY BATTERY LIGHTING

A. Lighting fixtures indicated on the drawings to be provided with an emergency battery ballast shall provide emergency lighting by using a standard fluorescent lamp or lamps and an emergency battery ballast. The ballast shall consist of a field replaceable high temperature, maintenance free nickel cadmium battery, charger and electronic circuitry contained in one metal case. Provide a solid state charging indicator light to monitor the charger and battery, double pole test switch and installation hardware. The battery ballast shall provide power to the fluorescent lamp upon failure of the normal supply to the fixture.

B. The test button and indicator light shall be integral in the fixture reflector and shall be positioned within or on the surface of the fixture so as to be accessible and identifiable.

C. Under normal mode the battery ballast shall keep the batteries at full charge. Upon loss of normal power the battery ballast shall operate the fluorescent lamp or lamps for 90 minutes.

D. Battery recharge time shall not exceed 16 hours to fully recharge and shall not exceed 225 milliamperes charging current.

E. The lumen output of the lamp or lamps powered by battery unit shall be not less than 1,100 lumens initially for a four-foot fluorescent lamp.

F. The battery ballast shall meet or exceed all the requirements set fourth in UL924 "Emergency Lighting and Power Equipment" and shall be UL listed for installation on top of or remote from the fixture. Emergency illumination shall meet or exceed the requirements set fourth in the National Electric Code, Life Safety Code and UL 90-Minute Requirements.

2.6 LIGHT FIXTURE TRIM

A. Each recessed lighting fixture shall have a trim to match the type of ceiling (plaster, exposed grid, concealed spline, exposed panel, etc.) in which it is being installed, regardless of catalog number given. Coordinate with the Architect's reflected ceiling plan to provide the right trim for the type of ceiling the fixture is to be installed in.

B. Each lighting fixture recessed in a plastered ceiling of any type shall have a plaster frame.

2.7 LIGHTING CONTROL

A. Provide a Photo/Time Control Center of the digital electronic type, which shall be suitable to operate mechanically held relays. The time switch shall function to prevent energization of lighting for preset periods each day. The time switch shall permit programming to allow 40 different ON-OFF settings for each day of the week per circuit with provision for omitting selected days. When permitted by the time switch, photocontrol shall operate the control center to energize whenever natural lighting falls below 25 footcandles.

B. The Control Center shall have a manual switching for each circuit to maintain lighting "ON" or "OFF" until manually returned to the "Automatic" position. The Control Center shall have a case cover to prevent external accessibility of the bypass switches.

C. The Control Center shall have one-year cumulative battery reserve.

D. The Control Center shall have a duty cycling feature allowing 1 to 99 ON or OFF inputs per circuit per day.

E. A Tork 5401 DPST shall be provided with the Control Center.

F. The Control Center shall have capability of controlling three (3) different types of circuits as described below:

Circuit A - Dusk (Photocell) On - Preset (Timeswitch) Off
Circuit B - Dusk (Photocell) On - Dawn (Photocel) Off
Circuit C - Preset (Timeswitch) On - Preset (Timeswitch) Off

G. The Time Control Center shall be Tork Model K800 (or Paragon DL series equal). Submit all devices and connection diagrams.

H. Provide all necessary contactors and/or to operate all circuits shown to be controlled. The relays/contactors shall have the number of poles required by the circuits controlled plus two (2) spare poles.

2.8 RECESSED INCANDESCENT FIXTURES

A. All recessed incandescent fixtures shall comply with Article 410-65, C of the N.E.C.

PART 3 - EXECUTION

3.1 SUPPORT OF LIGHTING FIXTURES

A. All lighting shall be supported from the building structure. The fixtures shall be supported in a manner that will insure the fixture weight being equally distributed from each support and the fixture remaining in a level position.

B. Fluorescent fixtures installed recessed in a suspended ceiling system shall be supported from the building structure with two (2) 12 gauge wires on diagonal corners of the fixture. In addition, the fixture shall be clipped to members of the ceiling suspension system.

C. Fluorescent fixtures installed in or on any ceiling other than a suspended ceiling system specifically mentioned above shall be supported with concealed steel rods. Rods shall be 1/4" diameter minimum and shall be located where recommended by the fixture manufacturer.

Provide a minimum of two (2) supports for each 4' or 8' fixture chassis. Supports shall be maximum of 48" centers. For incandescent fixtures, steel hanging wire may be used by attaching the wire to the fixture mounting frame.

D. Pendant mounted incandescent fixtures shall be stem supported by a fixture stud mounted in the outlet box. Suspended fluorescent fixtures shall have mounting stems located as per the manufacturer's recommendations, but in no case shall have less than two (2) stems per chassis.

3.2 AIMING OF ADJUSTABLE LIGHT FIXTURES

A. All fixtures with lamp position, tilt, shutters, rotation, or other types of adjustments during the final inspection. Fixtures serving areas where day lighting is predominant will be adjusted after sunset.

3.3 LIGHT FIXTURES IN MILLWORK

A. Special attention shall be given to lighting fixtures indicated to be mounted within, under, on or otherwise incorporated into millwork or cabinetry.

B. Refer to the Architectural drawings and details for specific dimensions. This coordination shall occur prior to ordering fixtures to assure fixtures will fit the space limitations of the millwork.

C. This requirement is intended to preclude incurring additions to the Contract due to fixtures being too small or too large for the space.

3.4 FINAL PREPARATION

A. All plastic covers shall be removed from fluorescent fixtures.

B. Clean all lens and reflectors from debris, fingerprints, dust, etc.

END OF SECTION D26300

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SECTION 33 10 05 – RAINWATER STORAGE TANKS

PART 1 - GENERAL

1.1 SUMMARY

A. System Description:
1. System shall be comprised of the following major components:
a. Tanks made of High Density Polyethylene with 3" Vent, 2" inlet, 1 1/2" bottom drain outlet. Tank(s) will have (2) 3/4" half-couplings for High and Low Level Sensors.
b. Level Control Package shall include Sensor with Controller. The Level Sensors shall be inserted through the sidewall of the tank in a 3/4" half coupling. The panel shall be NEMA 4X with indicator lights for High and Low Level plus manual override for low level to allow filling the tank with domestic water to a level other than at the low level point.
c. The Low Level Sensor shall cause the PLC Controller to open an automatic valve to add domestic water supply to enter the tanks. The valve will close when the Low Level Sensor is seeing liquid. There will be a timer circuit which will require maintained liquid contact for a period of time to inhibit chattering of the valve when liquid approaches the low level.
d. The High Level Sensor shall cause the PLC Controller to close the inlet supply valve to the tank(s) and divert remaining flow to sewer.
e. The Programmable Controller (PLC) provided with the control package will also include a timer activated by a liquid sensor in the roof drain systems that will cause a diverter valve to direct rain flow to sewer for a selected period of time (3-5 minutes) to allow debris from the roof to be sent to the sewer and not contained into the water storage tanks.
f. Piping manifolds can be pre-piped and installed on the tank(s). The piping material shall be Schedule 80 CPVC with Type 546 True Union Ball Valves and constructed of CPVC with EPDM O-Rings and Teflon Seals. The inlet manifold shall be 2" pipe size and the outlet shall be 1 1/2". The bottom outlet manifold shall include valve configuration to allow isolation and easy drainage for cleaning.

B. Description of Work:
1. Provide excavation and base preparation per Geotechnical Engineer's recommendations and/or as shown on drawings, to provide adequate support for project design loads and safety from excavation sidewall collapse.
2. Contractor shall furnish and install HDPE polyethylene tank, pump, filtration system plus fittings and fixtures as necessary for in-ground installation. The tank shall be of **6000 gallon** capacity and shall meet all requirements of the NC State Building Code 2006 edition.
3. Provide all necessary products including geotextiles, geogrids, inlet and outlet pipe with connections and installation per the manufacturer's instructions.

C. Related Work
1. Subgrade excavation and preparation.
2. Subsurface drainage materials and structure.

D. Reference:
1. All tanks provided must be certified to and/or listed with both CSA and IAPMO. CSA and UPC (IAPMO) marks must be clearly molded into the tank. In addition, all state and local regulations and codes shall be followed.

E. Standards
1. The following recognized testing methods for plastic materials shall apply:
   a. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
   b. ASTM D1693 – Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
   c. ASTM D638 – Standard Test Method for Tensile Properties of Plastics
   d. CSA International – B66-00 Prefabricated Septic Tanks and Sewage Holding Tanks
   e. International Association of Plumbing and Mechanical Officials – IAPMO PS 1-98 Material and Property Standard for Prefabricated Septic Tanks
   f. ASTM D790 – Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

1.2 SUBMITTALS

A. Product Data: For the following:

1. Cistern tank filters.
2. Pipe and fittings, including cleanouts.
3. Manufacturers product data and installation instructions.
4. Material certificates for geotextile, geogrid, base course and backfill materials.

B. Shop Drawings: Include manhole openings, covers, pipe connections, and accessories for the following structures:

1. Rainwater Cistern Tanks.

2. Pump and filtration system.

3. Pipe and fitting diagrams, including cleanouts.

C. Coordination Drawings: Show piping, underground structures, pump, filtration system and other utilities. Indicate size and invert elevations of piping and structures.

D. Field quality-control test reports.

1.3 DELIVERY, STORAGE & HANDLING

A. Upon arrival, inspect tank, including the interior, for any damage that may have occurred during handling and transportation. Remove damaged or rejected materials from site.

B. Store tank on flat surface and secure against movement.

C. Store tank under tarp to protect from sunlight when time of delivery to installation exceeds one week. Storage should occur on smooth surfaces, free from dirt, mud and debris.

D. Handling is to be performed with equipment appropriate to the size of the tank and site conditions, with care given to minimize damage.

E. Prevent damage to tank during setting and connection.

1.4 PROJECT CONDITIONS

A. Review installation procedures and coordinate work with other work affected, including excavation, utilities, construction access, and erosion control.

B. Cold Weather:
1. Do not use frozen materials or materials mixed or coated with ice or frost.
2. Do not build on frozen work or wet, saturated or muddy subgrade.
3. Care must be taken when handling tanks when air temperature is at 40 degrees or below as plastic may become brittle.

C. Environmental: Contractor to comply with all federal, state and local environmental requirements and setbacks.

D. Protect partially completed installation against damage from other construction traffic when work is in progress, and following completion of backfill, with highly visible construction tape, fencing, or other means until construction is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Prefabricated Polyethylene Tanks:
1. The polyethylene used shall comply with ASTM Standard D1248, Specification for Polyethylene Plastics Molding and Extrusion Materials. Raw materials shall meet or exceed the following:
a. D1248, Class B – requiring ultraviolet stabilizer or
b. D1248, Class C – requiring a minimum 1% carbon black and
c. D638 – Tensile strength of 2,400 pounds or greater
d. D1693 – Environmental stress crack resistance of 150 hours or more
e. D790 – Flexural modulus of elasticity of 85,000 pounds or greater.

B. Base of Excavation:
1. Shall be smooth soil, level and free of lumps or debris. Compact to at least 90% or as required by Engineer. Structural fill material may be used to amend the structural capacity of the soil, and should be placed on top of the geogrid layer if needed. Materials that cannot be stabilized by compaction, such as sand and/or drainage rock, should be avoided.

C. Geogrid:
1. Use geogrid product, such as Tensar BX1200 or equal, to overlay the excavation floor, and above the completed liner, extending at least twice the width of side backfill, with geogrid joints overlapped by at least 12".

D. Geotextile:
1. Shall be non-woven PP or PET with a weight of at least 8oz per square yard, appropriate for the soil type and depth conditions, placed on the floor of the excavation, the sides of the chamber, and chamber top.

E. Side Backfill:
1. Structural fill or sand materials, free from lumps and debris or any other sharp materials to backfill along the sides of the cellular structure, taking care to compact with powered

mechanical compactor, in lifts that do not exceed 12", to provide a settlement-free surface over the top and sides of the structure.

F. Top Backfill:
1. Use 12" minimum to 36" maximum depth of 3/4" minus sandy/gravel roadbase material (with fines less than 3%).
   a. If backfill mixture must be custom mixed, use a ratio of 2 parts clean 3/4" drainage rock to 1 part clean sharp sand.

G. Utility Marker:
1. Use metallic tape at corners of install to mark the area for future utility detection.

H. Tank Construction:
1. All tanks shall be of monolithic construction and shall be blow molded using high molecular weight HDPE resin. There shall be no metal parts molded into polyethylene tanks. Field assembly or modification of tanks is strictly prohibited with the exception of basic piping systems and risers.
2. Wall Thickness and Tank Weight:
   a. Wall thickness of all polyethylene tanks shall be determined by manufacturer's design to meet performance standards as set forth in Section 3 and shall be a minimum of 0.25 inches. Internal baffles and partitions shall be determined by manufacturer's design to meet performance standards as set forth in Section 3 and shall be a minimum of 0.1875 inches.
   b. The tanks shall have a minimum weight to volume ratio of 0.35 pounds per total gallon of capacity. This ratio shall be calculated by dividing the net weight of the tank only (without lids, risers, compartment walls, t-baffles, etc.) by the total capacity of the tank. Total capacity shall be defined as the volume in gallons of the tank when completely filled and without airspace.
3. Tank Pumping:
   a. All tanks shall have sufficient structural integrity to withstand being pumped dry without incurring structural deformation (i.e. rib collapse).
4. Riser Connections:
   a. All risers shall be watertight, available in 6-inch increments and be able to extend to grade from the maximum burial depth. Riser covers shall be lockable.

2.2 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.

2.3 RAINWATER STORAGE TANKS

A. Tanks: ASTM C 1227, two-chamber, reinforced-tank and covers.
1. Manholes: **20-inch- (508-mm-)** minimum diameter opening with reinforced-risers to grade and access lid with steel lift rings. Include manhole in center of each septic tank compartment top.
2. Filter Access: Reinforced-access hole, large enough to remove filter, over filter position.
3. Inlet and Outlet Access: **12-inch- (300-mm-)** diameter, reinforced-access lids with steel lift rings. Include access centered over inlet and outlet.

4. Resilient Connectors: ASTM C 923 (ASTM C 923M), of size required for piping, fitted into inlet and outlet openings.
5. Capacity: 6000 **gal.**

B. Tank Attachments
1. Sight Level Gage: The sight level gage shall be constructed of flexible PE tubing to allow for tank contraction and expansion due to loading and temperature changes. The level gage shall be connected to the tank with 2 Ea. Appropriate 3/4" fittings. Each fitting can have valves installed for isolation or drainage purposes.
2. Float Level Gage: The float level gage shall be constructed of a guided float on the inside of the tank connected to a weight indicator on the exterior of the tank with a 1/4" rope. The weighted indicator shall move along inside a clear guide pipe and may be equipped with an optional gallonage indicator board. The gallonage indicator board is made of PVC material and may be attached to the clear guide pipe. The board shall be stenciled with one hundred gallon marks and labeled every five hundred gallons. The level gage shall be connected to the tank at an appropriate tank flat on the tank dome with a 3" threaded bulkhead fittings and held along the tank sidewall with appropriate 1" fittings and stand-off connections.
   a. The float level gage rigid components shall be constructed of PVC or other specified material. The rope shall be constructed of polypropylene or other specified material. Gaskets shall be constructed of EPDM, Viton or other specified material.
3. Ultrasonic level Indicator: The ultrasonic level indicator shall consist of 2 or 3 inch, 4-20 mA output PVC sensor and a 3 1/2 digit dispay unit. The sensor may be equipped with male pipe threads and be connected to the tank with a PE bulkhead fitting, or the sensor may be Teflon faced and flange bolted to the tank with encapsulated 316 S.S. bolts. The sensor is connected to a display unit that is mounted to the containment tank. The display unit box shall be NEMA 4 rated and factory pre-wired for 110 VAC power. All connections shall be labeled to prevent errors in field installation. The display unit is preprogrammed for the tank ordered. The display will show hundreds of gallons (display x 100 = gallons).
4. Down Pipes and Fill Pipes: Down pipes and fill pipes shall be prepared per the customer approved drawings and specifications. All down pipes and fill pipes shall be supported at 5ft. maximum intervals with support structures. Standard support structure design shall utilize bulkhead fitting tank attachments. All designs shall be done according to the specific needs of the customer.
   a. All down pipes and fill pipes shall be constructed of PVC or other specified materials.
5. U-Vents: Each tank must be properly vented for the type of material and flow rates expected. Vents must comply with OSHA 1910.106 normal venting for atmospheric tanks or other accepted standard, or shall be as large as the filling or withdrawal connection, whichever is larger but in no case less than 1 inch nominal inside diameter.
   a. All U-vents shall be constructed of PVC or other specified materials.

2.4 FILTERS

A. Description: Removable, tank-outlet filter that restricts discharge solids to 1/8 inch (3.2 mm).

1. Available Manufacturers:

   a. Premier Tech Environment.
   b. Tuf-Tite Corp.
   c. Zabel Industries International, Ltd.

2. Housing: HDPE or PVC.

3. Outlet Size: **NPS 4 (DN 100).**

2.5 DISTRIBUTION PIPES AND FITTIINGS

A. Refer to Part 3 "Piping Applications" Article for identification of systems where piping materials specified below are used.

B. Pipe and Fittings: PVC, complying with ASTM D 3034, SDR 35, nonperforated, for solvent-cement or elastomeric gasket joints.

1. Solvent Cement: ASTM D 2564.
2. Gaskets: ASTM F 477, elastomeric seal.

2.6 NONPRESSURE-TYPE PIPE COUPLINGS

A. Description: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.7 CLEANOUTS

A. PVC Cleanouts: PVC pipe fitting for solvent-cement or elastomeric gasket joint with PE or PVC threaded cleanout plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements and other conditions affecting performance of septic tank systems.

B. Verify compatibility with and suitability of soil structure and materials.

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

3.2 EARTHWORK

A. Excavating and Backfilling for Rainwater Storage Tanks:

1. Excavate sufficient width and length for tanks to depth determined by tank inlet elevation. Provide level bottom.
2. Backfill with excavated soil, mounding soil above original grade without compacting.

3.3 RAINWATER STORAGE TANK INSTALLATION

A. Install tanks level.

B. Install filter in tank outlet. Secure filter to tank wall. Make direct connections to distribution piping.

C. Fill tank with water.

3.4 PIPING INSTALLATION

A. Install distribution piping according to the following:

1. PVC Pipe and Fittings: ASTM D 2321.

3.5 PIPE JOINT CONSTRUCTION

A. Basic piping joint construction is specified in Division 15. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Join distribution piping according to or with the following:

1. Install distribution pipe and fittings to connect septic tank with closed joints.
2. PVC Pipe and Fittings: ASTM F 402 and ASTM D 2855 for solvent-cemented joints, or ASTM D 3212 and ASTM D 3034 for gasketed joints.

C. Join dissimilar pipe materials according to ASTM D 5926, with couplings and gaskets compatible with pipe materials being joined.

3.6 CLEANOUT APPLICATIONS

A. Use cleanouts according to the following:

1. Inlet and Outlet of Septic Tanks: PVC cleanouts.

3.7 CLEANOUT INSTALLATION

A. PVC Cleanouts: Install with PVC riser from distribution piping to PVC cleanout at grade. Use NPS 4 (DN 100) PVC sewer pipe and fittings with solvent-cemented joints for risers and cleanout fitting.

B. Cleanout Support: Set cleanouts in concrete blocks **18 by 18 by 12 inches (450 by 450 by 300 mm)** deep, unless location is in concrete pavement. Formwork, reinforcement, and concrete are specified in Division 03 Section "Cast-in-Place Concrete."

C. Set top of cleanout **2 inches (50 mm)** above surrounding rough grade, or set flush with grade if installed in pavement.

3.8 IDENTIFICATION

A. Arrange for installation of green warning tape directly over piping, at outside edges of underground structures.

B. Use detectable warning tape over piping, over edges of underground structures, and over edges of absorption fields.

3.9 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.10 FIELD QUALITY CONTROL

A. System Tests: Perform testing of completed tank system piping and structures according to authorities having jurisdiction.

B. Additional Tests: Fill underground structures with water and let stand overnight. If water level recedes, locate and repair leaks and retest. Repeat tests and repairs until no leaks exist.

3.11 CLEANING

A. Clear interior of piping and structures of dirt and other superfluous material as work progresses.

B. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of workday or when work stops.

END OF SECTION 33 10 05

COMPENSATION for BUILDING CONSTRUCTION REST AREA / VISITOR CENTER / VENDING

CONSTRUCTION OF REST AREA BUILDING (Southbound Lane)

The work of furnishing all materials and constructing the **Rest Area Building** in accordance with the plans and specifications, completed and accepted to include **Underground Electric / Phone Service** from Transformer to Building , furnishing all materials and installing **Water Service Lines** from the meter to all buildings ,Constructing **Sewer Manhole** and **installing Sewer Service Lines** from the manhole to all buildings, installing **Yard Inlet Drains & Piping** , installing **Cistern Tanks / Valves** and **Roof Gutter Collection Piping** from all Buildings into the cistern tanks , as shown in accordance with the plans and specifications will be paid for at the contract unit price for "Construction of Rest Area Building (Southbound Lane) Such price and payment will be full compensation for all work of constructing the Rest Area Building including but not limited to furnishing all materials, labor, tools, equipment, and any incidentals necessary to complete the work.

Payment will be made under:

" Construction of Rest Area Building (Southbound Lane) " ..... Lump Sum

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CONSTRUCTION OF VISITOR CENTER BUILDING (Southbound Lane)
.....(**GREEN ROOF BUILDING**).....

The work of furnishing all materials and constructing the **Visitor Center Building** in accordance with the plans and specifications, completed and accepted to include connection to all utilities , **Underground Electric / Phone Service** from Transformer to Building , **installation of the green roof system , growing media / plants** and installation of the **outside water feature** (pump,controls,rock,etc.) will be paid for at the contract unit price for Construction of Visitor Center Building (Southbound Lane) Such price and payment will be full compensation for all work for the Visitor Center building including but not limited to furnishing all, materials, labor, tools, equipment, and any incidentals necessary to complete the work.

Payment will be made under:

" Construction of Visitor Center Building " (Southbound Lane) " .....Lump Sum

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CONSTRUCTION OF VENDING MACHINE BUILDING (Southbound Lane)

The work of furnishing all materials and constructing the **Vending Machine Building** in accordance with the plans and specifications, completed and accepted, **including connection to all utilities**, will be paid for at the contract unit price for Construction of Vending Machine Building (Southbound Lane). Such price and payment will be full compensation for all work of constructing the Vending Machine Building including but not limited to furnishing all materials, labor, tools, equipment, and any incidentals necessary to complete the work.

Payment will be made under:

" Construction of Vending Machine Building " (Southbound Lane) " .....Lump Sum

COMPENSATION for BUILDING CONSTRUCTION REST AREA / VISITOR CENTER / VENDING

CONSTRUCTION OF REST AREA BUILDING (Northbound Lane)

The work of furnishing all materials and constructing the **Rest Area Building** in accordance with the plans and specifications, completed and accepted to include **Underground Electric / Phone Service** from Transformer to Building furnishing all materials and installing **Geo–Tech Fabric** under the slab, **Water Service Lines** from the meter to all buildings ,Constructing **Sewer Manhole** and **installing Sewer Service Lines** from the manhole to all buildings, installing **Yard Inlet Drains & Piping** , installing **Cistern Tanks / Valves** and all **Roof Gutter Collection Piping**, from all Buildings into the cistern tanks as shown in accordance with the plans and specifications will be paid for at the contract unit price for Construction of Rest Area Building (Northbound Lane) Such price and payment will be full compensation for all work of constructing the Rest Area Building including but not limited to furnishing all materials, labor, tools, equipment, and any incidentals necessary to complete the work.

Payment will be made under:

" Construction of Rest Area Building (Northbound Lane) " ..... Lump Sum

CONSTRUCTION OF VISITOR CENTER BUILDING (Northbound Lane)

The work of furnishing all materials and constructing the **Visitor Center Building** in accordance with the plans and specifications, completed and accepted to include connection to all utilities ,**Underground Electric / Phone Service** from Transformer to Building, and **Installation / Above Ground Cistern Tanks** , will be paid for at the contract unit price for Construction of Visitor Center Building. Such price and payment will be full compensation for all work for the Visitor Center building (Northbound Lane) including but not limited to furnishing all, materials, labor, tools, equipment, and any incidentals necessary to complete the work.

Payment will be made under:

" Construction of Visitor Center Building " (Northbound Lane) " .....Lump Sum

CONSTRUCTION OF VENDING MACHINE BUILDING (Northbound Lane)

The work of furnishing all materials and constructing the **Vending Machine Building** in accordance with the plans and specifications, completed and accepted, **including connection to all utilities**, will be paid for at the contract unit price for Construction of Vending Machine Building. Such price and payment will be full compensation for all work of constructing the Vending Machine Building (Northbound Lane) including but not limited to furnishing all materials, labor, tools, equipment, and any incidentals necessary to complete the work.

Payment will be made under:

" Construction of Vending Machine Building " (Northbound Lane) " .....Lump Sum