PROJECT MANUAL

FOR

CAPE HENLOPEN SCHOOL DISTRICT

CAPE HENLOPEN HIGH SCHOOL ADDITIONS

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ABHA PROJECT NUMBER: 1812 — **NOT FOR CONSTRUCTION**

DATE: JULY 31, 2019

CD REVIEW
VOLUME 2 OF 4

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CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

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

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.
2. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.
3. Division 2 Section "Decorative Cement Concrete Pavement" for decorative concrete pavement and walks.

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. Welding certificates.

F. Qualification Data: For Installer, manufacturer, testing agency.

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

1. Aggregates.

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

1. Cementitious materials.

2. Admixtures.

3. Form materials and form-release agents.

4. Steel reinforcement and accessories.

5. Waterstops.

6. Curing compounds.

7. Floor and slab treatments.

8. Bonding agents.

9. Adhesives.

10. Vapor retarders.

11. Semirigid joint filler.

12. Joint-filler strips.

13. Repair materials.

I. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

J. Field quality-control test reports.

K. Minutes of preinstallation conference.

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. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

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

1. ACI 301, "Specification for Structural Concrete,"

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixtures.

c. Ready-mix concrete manufacturer.

d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, [curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, vapor-retarder installation, steel reinforcement installation, floor and slab flatness and levelness measurement**,** and concrete protection.

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.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.

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. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. 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.

E. 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 (25 mm) to the plane of exposed concrete surface.

2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) 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 (Grade 420), deformed.

B. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420) , deformed bars, assembled with clips.

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 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

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 C.

b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

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

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.

3. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C. Provide at exterior concrete slabs.

1. Products:

a. Boral Material Technologies, Inc.; Boral BCN.

b. Euclid Chemical Company (The); Eucon CIA.

c. Grace Construction Products, W. R. Grace & Co.; DCI.

d. Master Builders, Inc.; Rheocrete CNI.

e. Sika Corporation; Sika CNI.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete. Provide at exterior concrete slabs.

1. Products:

a. Axim Concrete Technologies; Catexol 1000CI.

b. Boral Material Technologies, Inc.; Boral BCN2.

c. Grace Construction Products, W. R. Grace & Co.; DCI-S.

d. Master Builders, Inc.; Rheocrete 222+.

e. Sika Corporation; FerroGard-901.

E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Manufacturers:

a. Bayer Corporation.

b. ChemMasters.

c. Conspec Marketing & Manufacturing Co., Inc.; a Dayton Superior Company.

d. Davis Colors.

e. Elementis Pigments, Inc.

f. Hoover Color Corporation.

g. Lambert Corporation.

h. Scofield, L. M. Company.

i. Solomon Colors.

2. Color: As selected by Architect from manufacturer's full range.

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 (19 by 25 mm).

1. Products:

a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.

b. Approved equal

2.8 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class C**,** or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

1. Products:

a. Fortifiber Corporation; Moistop Plus.

b. Raven Industries Inc.; Dura Skrim 8.

c. Reef Industries, Inc.; Griffolyn Type-85.

d. Stego Industries, LLC; Stego Wrap, 10 mils.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.9 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Provide at all exposed concrete surfaces to be treated to harden, seal and densify exposed concrete. Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products:

a. Dayton Superior Corporation; Day-Chem Sure Hard.

b. Euclid Chemical Company (The); Euco Diamond Hard.

c. L&M Construction Chemicals, Inc.; Seal Hard.

d. Meadows, W. R., Inc.; Liqui-Hard.

B. Stained Hardener with matching cure/sealer - Pigmented Mineral Dry-Shake Floor Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading

mineral oxides interground with cement. Placing of hardener is followed by manufacturer's recommended water membrane-forming cure and seal: ASTM C 309

1. Products:

   a. L&M Construction Chemicals, Inc.; Quartz Plate FF Hardener followed by Dress & Seal WB 30 per manufacturer's recommendations and specifications.

   b. Scofield, L. M. Company; Lithochrome Color Hardener followed by Lithochrome Colorwax in matching color per manufacturer's recommendations and specifications.

2.10 CURING MATERIALS

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

   1. Products:

      a. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.

      b. Dayton Superior Corporation; Sure Film.

      c. Euclid Chemical Company (The); Eucobar.

      d. L&M Construction Chemicals, Inc.; E-Con.

      e. Meadows, W. R., Inc.; Sealtight Evapre.

      f. Sika Corporation, Inc.; SikaFilm.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

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

   1. Products:

      a. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).

      b. Euclid Chemical Company (The); Kurez DR VOX.

      c. L&M Construction Chemicals, Inc.; L&M Cure R.

      d. Meadows, W. R., Inc.; 1100 Clear.

      e. Tamms Industries, Inc.; Horncure WB 30.

2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

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

C. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

D. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) 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 (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) 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 topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

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. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

2. Silica Fume: 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement at exterior conditions and 0.30 percent by weight of cement at interior conditions.

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

1. Use water-reducing or plasticizing 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, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup. Coordinate color and location with Architect.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

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

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.

2. Maximum Water-Cementitious Materials Ratio: 0.50.

3. Slump Limit: 3 inch minimum and 5 inch maximum (at point of concrete placement), plus or minus 1 inch (25 mm).

4. Exposure Class: F2, S0, C1, P0

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

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.

2. Maximum Water-Cementitious Materials Ratio: 0.50.

3. Slump Limit: 3 inch minimum and 5 inch maximum (at point of concrete placement), plus or minus 1 inch (25 mm).

4. Exposure Class: F2, S0, C1, P0

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

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.

2. Minimum Cementitious Materials Content: 520 lb/cu. yd. (309 kg/cu. m).

3. Slump Limit: 3 inch minimum and 5 inch maximum (at point of concrete placement), plus or minus 1 inch (25 mm).

4. Exposure Class: F2, So, C1, P0

D. Slabs-on-Grade – Exterior (Exposed to Exterior Conditions): Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4500 psi (31 MPa) at 28 days.

2. Minimum Cementitious Materials Content: 520 lb/cu. yd. (309 kg/cu. m).

3. Slump Limit: 3 inch minimum and 5 inch maximum (at point of concrete placement), plus or minus 1 inch (25 mm).

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

6. Exposure Class: F2, S0, C2, P0

E. Suspended Slabs: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3500 psi (24.1 MPa) at 28 days.

2. Minimum Cementitious Materials Content: 470 lb/cu. yd. (309 kg/cu. m).

3. Slump Limit: 3 inch minimum and 5 inch maximum (at point of concrete placement), plus or minus 1 inch (25 mm). For pumpable concrete, slumps may be increased by 3 inches.

4. Exposure Class: F0, S0, C0, P0

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 (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

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 (3.2 mm) for smooth-formed finished surfaces.

2. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

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. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

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

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

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 (150 mm) and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair vapor retarders according to manufacturer's written instructions.

C. Granular Course: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

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.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. 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. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

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

7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

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

3.8 WATERSTOPS

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

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

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

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 (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

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.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

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.

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

1. Maintain concrete temperature below 90 deg F (32 deg C) 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 be covered with a coating or covering material applied directly to concrete.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

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

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface and per ACI 117 "Specification For Tolerances For Concrete Construction & Materials":

a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20 as a minimum. Coordinate and specify minimum F(F) and F(L) values with flooring manufacturer during concrete pre-installation conference. Note: Flooring manufacturer may require very flat surface classification (F(F) 45; F(L) 35) or super flat surface classification (F(F) 60 ; F(L) 40). Coordinate locations and requirements prior to installation.

b. Provide maximum floor variation of 1/8" in 10' and 1/16" in 1' for terrazzo floor tile area or requirement as indicated by product manufacturer, whichever is more stringent.

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.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.

   b. Continuous water-fog spray.

   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound

manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas 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 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill 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 (0.25 mm) 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. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to 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. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.

2. Steel reinforcement welding.

3. Headed bolts and studs.

4. Verification of use of required design mixture.

5. Concrete placement, including conveying and depositing.

6. Curing procedures and maintenance of curing temperature.

7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. 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 one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

   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.

3. 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.

4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

6. 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.

7. Compression Test Specimens: ASTM C 31/C 31M.

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

   b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. 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.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

11. 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.

12. 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.

13. 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.

14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

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

E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 48 hours of finishing. Values to be documented and provided to Architect and Flooring Manufacturer prior to placing flooring.

END OF SECTION

SECTION 03 30 50
INTEGRAL CONCRETE WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Crystalline waterproofing admixture for concrete.

B. Crystalline waterproofing treatment and waterstops of construction joints between successive concrete pours.

C. The work of this section applies to concrete in the following locations:
   1. Large Group Instruction - floor slab and side walls below grade.
   2. Elevator pit floor slab and side walls below grade.

1.02 RELATED SECTIONS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete materials and placement.

B. Section 07 1300 - Sheet Waterproofing

1.03 REFERENCES

A. ACI 305R - Hot Weather Concreting.

B. ACI 306R - Cold Weather Concreting.

C. ACI 308 - Standard Practice for Curing Concrete.

D. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

E. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

F. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

G. ASTM E 329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

H. COE CRD-C 48 - Standard Test Method for Water Permeability of Concrete.

1.04 SUBMITTALS

A. Submit manufacturer's certification that proposed materials, details and systems as indicated and specified fully comply with manufacturer's details and specifications. If any portion of Contract Documents do not conform to manufacturer's standard recommendations, submit notification of portions of design that are at variance with manufacturer's specifications

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

C. Manufacturer's Certificates:
   1. Certify products meet or exceed specified requirements.
   2. Certify that proposed material is compatible with concrete mix design

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm with not less than 10 years experience manufacturing crystalline waterproofing of the type specified, able to provide test reports showing compliance

with specified performance characteristics, and able to provide on-site technical representation to advise on installation.

B. Installer Qualifications: Experienced in work of the type specified in this section and acceptable to waterproofing manufacturer.

C. Preinstallation Meeting: Before installation, conduct a meeting with the Contractor, waterproofing installer, installers of adjacent work and work penetrating waterproofing, and the waterproofing manufacturer's representative to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer' warranty requirements; notify the Owner and Architect/Engineer at least one week in advance of meeting.
   1. Trial mixes shall be carried out with proposed mix design to insure that mix meets all requirements set forth in the specification, prior to actual installation of concrete.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.07 PROJECT CONDITIONS

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

1.08 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty document executed by authorized company official; warranty period: 25 years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer:
   1. Xypex Chemical Corp., 13731 Mayfield Pl. Richmond, BC, Canada V6V 2G9; 800-961-4477; Tel: 604-273-5265; Web: www.xypex.com.
   2. AQUAFIN, Inc. 505 Blue Ball Rd., #160, Elkton, MD, 21921 (800) 394-1410 or (410) 392-2300, Fax (410) 392-2324; Web: www.aquafin.net.
   3. Kryton International Inc. 1645 East Kent Avenue, Vancouver BC V5P 2S8; 800-267-8280; Tel: 604-324-8280; Fax: 604-324-8899; Web: www.kryton.com.

B. Requests for substitutions will be considered in accordance with provisions of Division 1.

2.02 MATERIALS

A. Product: Xypex Admix C-500, C-1000 or C-2000 manufactured by Xypex Chemical Corp

B. Product: Aquafin®-IC ADMIX manufactured by AQUAFIN, Inc.

C. Product: KIM manufactured by Kryton International Inc

D. Permeability: No measurable leakage through waterproofed concrete, when tested in accordance with COE CRD-C 48 at 350 feet (106 m) of head or 150 psi (1034 kPa).

E. Chemical Resistance: Minimum 20% less weight loss compared to untreated specimen after exposure to 5% sulfuric acid for 70 days, when tested as follows:

F. Test specimens consisting of concrete made with admixture dosage rates (to weight of cement) of 3 percent, 5 percent, and 7 percent, and a control sample prepared without admixture.

G. Compressive Strength: At least 10 percent increase in strength compared to samples prepared without admixture, when tested in accordance with ASTM C 39/C 39M after 28 days.

2.03 ACCESSORIES

A. Waterstops, cold-joint primer, grout and sealants:

1. Provide compatible materials manufactured by the integral concrete waterproofing manufacturer.

PART 3 EXECUTION

3.01 CONCRETE MIXING AND PLACING

A. Comply with requirements of Section 03 3000.

B. Make and test trial mixes under project conditions to determine setting time and strength of concrete; obtain manufacturer's recommendations regarding mix design, project conditions, and dosage rate.

C. Add waterproofing admixture at time of batching and blend thoroughly, following manufacturer's instructions.

D. In hot weather comply with ACI 305R; in cold weather comply with ACI 306R; use monomolecular film (evaporation retardant) on slabs during hot, dry, or windy conditions.

E. Moist cure concrete in accordance with ACI 308; if moist curing is not possible, use curing compound complying with ASTM C 309.

3.02 CONSTRUCTION JOINTS

A. Comply with manufacturer's instructions, including technical bulletins, catalog installation instructions, and product packaging labels.

B. Verify substrate conditions installed as specified in Section 03 3000 - Cast-in-Place Concrete are acceptable for product installation in accordance with manufacturer' instructions; do not install unless substrate and ambient air temperature are within range acceptable to waterproofing manufacturer.

C. Prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions.

D. Clean laitance, dirt film, paint, coatings or other foreign matter harmful to the performance of waterproofing from surfaces of cured concrete to be treated.

E. Mix materials in accordance with manufacturer's instructions.

F. Follow manufacturer's instructions for cold joint and waterstop installation.

3.03 FIELD QUALITY CONTROL

A. Do not cover admixture treated concrete with other construction until it has been observed by manufacturer's field representative and Architect/Engineer.

B. After removal of forms, patch and repair honeycombing, rock pockets, tie holes, faulty construction joints, cold joints, and cracks using waterproofing admixture manufacturer's recommended procedures.

C. Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of concrete batching and product installation in accordance with manufacturer's instructions.

D. Flood test areas that are capable of holding water after end of curing period.

1. Plug or dam drains.
2. Test slabs by constructing temporary dams where necessary, at least 2 inches (50 mm) high, and filling with 2 inches (50 mm) of water.
3. Let water stand for 24 hours.
4. Repair leaks and retest until no leaks are observed.

3.04 CLEANING AND PROTECTION

A. Protect installed concrete from damage during construction.

B. When backfilling occurs less than 7 days after installation, use moist backfill material.

C. Do not apply paint or other coatings for at least 21 days; before applying coatings neutralize waterproofed surface as recommended by waterproofing manufacturer.

END OF SECTION

SECTION 03 48 00
PRECAST CONCRETE STAIR TREADS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast Concrete Stair Treads.

1.02 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 05 51 00 - Metal Stairs.

1.03 REFERENCES

A. ASTM A 615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

B. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

C. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

D. ASTM C 293 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading).

E. ASTM F 1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

F. Federal Specification - FS TT-P-641, Type II - Paints, Coatings and Preservatives.

G. The Society for Protective Coatings:
   1. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide precast stair treads capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Live Load: 100 lbs. (45.4 kg) per square foot.
   2. Concentrated Load: 300 lbs (___ kg) applied to a 4 square inch (25.8 sq.cm.) area.
   3. Maximum Deflection: L/240 or 1/4 inch (6mm), whichever is less.
   4. Maximum Deflection: L/360 or 1/4 inch (6mm), whichever is less.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

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

C. Shop Drawings: Submit plan, section, elevation and perspective drawings as necessary to determine the required dimensions and placement location for each product specified as well as clarify the manufacturer's recommended installation, joinery and termination techniques.

D. Selection Samples: For each finish product specified, two samples representing manufacturer's full range of available colors and finishes.

E. Verification Samples: At the pre-construction meeting, provide two full size samples representing each specified product, showing color, finish. Sample may be used within the Work specified in this section, provided no damage has occurred to it prior to or during installation.

F. Include structural analysis data signed and sealed by the qualified professional engineer (P.E.) responsible for their preparation.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Transport, store and handle precast concrete stair treads in accordance with manufacturers written instructions.

B. Store precast concrete stair treads on pallets clear of mud and water. Stack precast concrete stair treads to allow air to circulate freely and keep treads dry.

C. Do not allow cast in anchor bolts to be damaged during handling or to rust during storage.

D. Transport and store stair treads so that edges and corners of treads are not damaged.

E. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.08 PROJECT CONDITIONS

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

1.09 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
   1. Duration: One (1) year from date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Camp Logan Cement Works, Inc., which is located at: 1212 Asbury St.; Houston, TX 77007-3194; Toll Free Tel: 800-445-9062; Tel: 713-869-3385; Fax: 713-869-3362; Email: request info (clcw@camplogancement.com)

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

2.02 MATERIALS

A. Concrete: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi (34.5 MPa) and a total air content of not less than 4 percent or more than 6 percent.

1. Flexural Strength: 2500 to 3000 psi (17.25 - 20.7 MPa) in accordance with ASTM C 293.
2. Water Absorption: 3 to 4 percent absorption in accordance with ASTM C 67.

B. Aggregate: Report sieve analysis in accordance with ASTM C 136.

C. Reinforcing Bars: #3 - 3/8 inch (10mm) deformed rebar meeting the requirements of ASTM A 615, Grade 40.

D. Provide manufacturer's standard epoxy coating on reinforcing bars.

E. Embedded Stair Tread Anchor Bolts: ASTM F 1554, Grade 36.
1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts with nuts for attaching and securing stair treads to stair framing.
2. Stair tread manufacturer's standard "shoulder nut" anchor bolt design to resist damage due to excessive torque stress on anchor bolt nut, or normal stair movement.

F. Water: Potable.

G. Tread Dimensions:
1. Tread Length: As indicated on drawings
2. Tread Width: As Indicated on Drawings
3. Tread Thickness: 3 inches (76mm).
4. Tread Profile/Edge: Standard, 87 degree angle with a 3/8 inch (10mm) eased edge. Leading face extends down 2 1/4 inches (57mm) from tread surface.

2.03 GALVANIZED STEEL FLNLSHES

A. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the air-dried primer specified below immediately after cleaning and pre-treating.
1. Shop Primer: Zinc-dust, zinc-oxide primer complying with performance requirements in FS TT-P-641, Type II.

2.04 PRECAST CONCRETE TREAD FLNLSHES

A. Surfacing: Light to medium broom finish with a 2 inch (51mm) edging.

B. Tool stair tread exposed edges to form a 3/8 inch (10mm) radius.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

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

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION, GENERAL

A. Cutting, Fitting, and Installation: Perform cutting, drilling, and fitting required for installing precast concrete stair treads. Set units accurately in location, alignment, and elevation, measured from established lines and levels.

B. Fastening to Metal Stairs: Provide anchorage devices and embedded threaded fasteners as indicated on approved submittals for securing precast concrete treads to metal stairs.

3.04 TOUCH-UP AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 - Painting.

3.05 FIELD QUALITY CONTROL

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Protect finishes on exposed surfaces from damage during manufacture and installation.

C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 03 49 00
GLASS-FIBER REINFORCED CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural precast glass-fiber-reinforced concrete (GFRC) cornices (pre-finished).

B. Supports, anchors, and attachments.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Placement of anchors specified in this section.

B. Section 05 40 00 - Cold-Formed Metal Framing: Structural stud members.

C. Section 07 9200 - Joint Sealants: Application of backer rods or bond breakers and joint sealers.

D. Section 09 9000 - Paints and Coatings: Field (touchup) painting of GFRC items.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2007a (Reapproved 2014).

D. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric]; 2007.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

H. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

J. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

K. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

L. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2016.

M. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

O. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products; 2007.

P. PCI MNL-128 - Recommended Practice for Glass Fiber Reinforced Concrete Panels; 2001, Fourth Edition.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: GFRC cornices and trim, including anchors, and connections, shall withstand the following design loads, as well as the effects of thermal- and moisture-induced volume changes, according to load factors and combinations established in PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panel."
   1. Design Loads:
      a. Exterior GFRC: Lateral Loads not less than 50 psf inward and outward.
   2. Deflection: Design panel frames to withstand design loads without lateral deflections greater than 1/240 of wall span.
   3. Thermal Movements: Provide for thermal movements resulting from annual ambient temperature changes of 120 degF.
   4. Design cornice frames and connections to accommodate deflections and other building movements.

1.05 SUBMITTALS

A. Shop Drawings: Indicate locations, fabrication and installation details for GFRC components including the following:
   1. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Reinforcement.
   3. Metal framing details.
   4. Connection details.
   5. Dimensions, and relationship to adjacent materials.
   6. Color selection charts / samples.
   7. Erection details, including the sequence for typical and special conditions, joint treatment.
   8. Repair procedures.

B. Samples: Submit one sample (12 inch length) of each profile.

C. Manufacturer's Installation Instructions: Indicate surface cleaning instructions.

D. Designer's Qualification Statement.

E. Fabricator Qualifications.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design units under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Delaware.

B. Fabricator Qualifications: Certified by the Precast/Prestressed Concrete Institute Plant Certification Program; product Group G, Glass Fiber Reinforced Concrete or that participates in APA's Plant Certification Program and is certified for GFRC production.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/Dl.lM, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.07 MOCK-UP

A. Construct one profile, six feet in length by the design diameter, including supporting backup structure, attachments, and vapor seals applied.
   1. Build mockup of typical wall area as shown on Drawings separately from building.
   2. In addition to GFRC panels, mockups include architectural precast concrete, unit masonry, aluminum windows, joint sealants, metal flashings and copings.

B. Locate where directed.

C. Mock-up may not remain as part of the Work.

1.08 PROJECT CONDITIONS

A. Coordinate the Work with installation of backup supporting structure, application of joint sealers.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Handle units to position, consistent with their shape and design. Lift and support only from support points.

B. Lifting Device: Capable of maintaining unit shape during manufacture, storage, transportation, erection, and in position for fastening.

C. Blocking and Lateral Support During Transport and Storage: Clean, non-staining, without causing harm to exposed surfaces. Provide temporary lateral support to prevent bowing and warping. Place spacers in same location during transport and site storage.

D. Protect edges of units to prevent staining, chipping, or spalling of concrete.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass-Fiber-Reinforced Concrete: Subject to compliance with the requirements of this Section, with special attention to the metal framing requirement, provide products from one of the following manufacturers:
   1. ARC, Ltd.
   2. Formglas, Inc.
   3. Stromberg Architectural Products, Inc: www.strombergarchitectural.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GLASS-FIBER-REINFORCED CONCRETE UNITS

A. Glass-Fiber-Reinforced Concrete Units: Factory-fabricated, complying with PCI MNL-128, using rigid molds, constructed to maintain unit panel uniform in shape, size and finish.
   1. Design and fabricate to comply with applicable code(s).
   2. Design to withstand dead loads, positive and negative wind loads, and erection forces.
   3. Control deflection of units to maintain fit with adjacent construction and openings within their tolerances.
   4. Design connections to accommodate building movement without damage to components, wracking of joint connections, breakage of seals, or moisture penetration.
   5. Allow for adjustment of connections to accommodate misalignment of structure without permanent distortion.
   6. Concrete Mix: Of strength to accommodate panel configuration, panel size and weight, and manufacturing criteria, air entrained.
   7. Welding: Comply with AWS D1.1/D1.1M.
   8. Appearance: Ensure exposed-to-view finish surfaces of units are uniform in color and appearance.

2.03 GFRC MATERIALS

A. Cement: ASTM C150/C150M Portland Type I - Normal; white color.

B. Concrete Aggregates: ASTM C33/C33M.

C. Sand for GFRC Backing: Washed and dried silica, complying with composition requirements ASTM C 144; passing No. 20 sieve with a maximum of 2 percent passing No. 100 sieve.

D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of GFRC and complying with the chemical limits of PCI MNL 130.

E. Reinforcement: Alkali resistant glass fiber rovings specifically formulated for use in concrete, with lengths varying from 1-1/2 to 2 inches (38 to 51 mm) with a minimum zirconia content of 16 percent complying with ASTM C 1666/C 1666M.

F. Admixtures: Comply with ASTM C260/C260M, ASTM C494/C494M, and ASTM C618.
   1. Metakaolin: ASTM C 618, Class N.
   2. Air-Entrainment Admixture: ASTM C 260, containing not more than 0.1 percent chloride ions.
   3. Chemical Admixtures: ASTM C 494/C 494M containing chloride ions are not permitted.

G. Polymer Curing Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130.

H. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
   1. Color(s): As selected by Architect from manufacturer's full range.

2.04 MOLD FABRICATION

A. Construct molds that will result in finished GFRC complying with profiles, dimensions, and tolerances indicated, without damaging GFRC during stripping. Construct molds to prevent water leakage and loss of cement paste.
   1. Coat contact surface with form-release agent.

B. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during GFRC application.
   1. Coat contact surface with form-release agent.

C. Locate, place and secure flashing reglets accurately.

2.05 FRAMING MATERIALS

A. Metal Framing Members: Formed from hot-dipped galvanized steel sheet, ASTM A653/A653M, SS Grade 50 (340) Class 1, with G90/Z275 coating.

2.06 SUPPORT DEVICES

A. Connecting and Support Devices: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.

B. Bolts, Nuts, and Washers: ASTM F3125/F3125M heavy hex structural bolts, Type 1, with matching ASTM A563 (ASTM A563M) nuts, and washers as follows:
   1. Standard Washers: ASTM F436/F436M washers, in finish matching bolts.

C. Primer: Zinc rich oil alkyd.

2.07 ACCESSORIES

A. Reglets: Plastic shaped and flanged to remain in place once cast; foam plastic filled to eliminate concrete intrusion.

2.08 FABRICATION

A. Spray-up concrete mix in multiple passes; maintain consistent quality during manufacture.

B. Place metal framing members in position in mold.

C. Embed anchors, inserts, plates, angles, and other cast-in items as indicated on shop drawings.

D. Fabricate connecting devices, items fit to framing members, fasteners and accessories necessary for proper installation.

E. Locate hoisting devices to permit device removal after erection.

F. Cure units to minimize appearance blemishes such as non-uniformity, staining or surface cracking.

G. Identify each unit with corresponding code on erection drawings, in location not visible in finish work.

H. Exposed Non-Galvanized Steel Components: Clean surfaces of rust, scale, grease, and foreign matter; prime paint in two coats, except surfaces in direct contact with concrete or requiring field welding.

2.09 FABRICATION TOLERANCES

A. Manufacturing Tolerances: Manufacturer GFRC panels so each finished unit complies with PCI MNL 130 for dimension, position and tolerances.

2.10 FINISHES

A. Finish exposed-face surface of GFRC shall be free of joint marks, grain, or other obvious defects.

1. Surface Finish: match approved architectural precast concrete and approved sample panels.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 PREPARATION

A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION

A. Coordinate installation with that of structural supports, backup, and opening framing, if any.

B. Erect units without damage to shape or finish. Replace or repair damaged panels.

C. Erect units level and plumb within allowable tolerances.

D. Align and maintain uniform horizontal and vertical joints as erection progresses.

E. When units require adjustment beyond design or tolerance criteria, discontinue affected work and advise Architect.

F. Site cutting of panels not permitted.

G. Weld units in place. Perform welding in accordance with AWS D1.1/D1.1M. Provide non-combustible shields during welding operations.

H. Touch-up field welds and scratched or damaged primed painted surfaces.

3.04 TOLERANCES

A. Maximum Variation from Plane of Location: 1/4 inch in 10 feet and 3/8 inch in 100 feet (6 mm in 3 m and 9 mm in 30 m), non-cumulative.

B. Maximum Offset from True Alignment Between Two Connecting Units: 1/4 inch (6 mm).

C. Maximum Out of Square: 1/8 inch in 10 feet (1 mm/m), non-cumulative.

D. Variation From Dimensions Indicated on Shop Drawings: Plus or minus 1/8 inch (3 mm).

E. Maximum Misalignment of Anchors, Inserts, Openings: 1/8 inch (3 mm).

F. Bowing of Units: Length of Unit/360.

G. Exposed Joint Dimension: 1/2 inch (12 mm) plus or minus 1/4 inch (6 mm).

H. Location of Reglets: 1/4 inch (6 mm) from true position.

3.05 FIELD QUALITY CONTROL

A. Perform water absorption test in accordance with PCI MNL-117.

3.06 PROTECTION

A. Protect installed units from damage.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Clay facing brick.

C. Mortar and grout.

D. Reinforcement and anchorage.

E. Lintels.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Division 1 - Administrative Requirements: Preconstruction meeting.

B. Division 1 - Quality Requirements: The Owner will engage an Independent Testing and Inspection Agency to verify the adequacy of the Contractor's quality control.
   1. Before concealing the work behind the brick veneer, obtain the required inspection from a representative of the Owner's independent testing and inspection agency.

C. Division 1 - Quality Requirements: Mock-up:
   1. Construct mock-ups where indicated on the drawings, incorporating all components specified for the location.
   2. Demolish mock-up when directed by Architect, and remove debris from the site.

D. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

E. Section 07 11 13 - Bituminous Dampproofing: Dampproofing masonry surfaces.

F. Section 07 1300 - Sheet Waterproofing: Waterproofing masonry surfaces.

G. Section 07 21 00 - Thermal Insulation: Insulation for cavity spaces.

H. Section 07 62 00 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

I. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

J. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 PRICE AND PAYMENT PROCEDURES

1.04 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.

F. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2017a.

G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2017.

H. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

J. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.

K. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

M. ASTM C476 - Standard Specification for Grout for Masonry; 2018.

N. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2017.

O. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength; 2013, with Editorial Revision (2014).

P. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2014).

Q. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2016.

R. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2014a.

S. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

T. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

U. UL (FRD) - Fire Resistance Directory; Current Edition.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting two weeks before starting work of this section; require attendance by all relevant installers.

B. Refer to Section 01 3000 - Administrative Requirements for additional information.

1.06 SUBMITTALS

A. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, masonry accessories, and cleaning products including application .

B. Samples: Submit two samples of facing brick units to illustrate color, texture, and extremes of color range.

C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements, including referenced material standards and fire ratings.

D. Shop Drawings: Provide shop drawings of vertical wall reinforcement and bond beam reinforcement. Submit, with copies to the Owner’s Independent Testing and Inspection Agency, shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Show details of construction, including dimensioned drawings, plans, elevations, sections, and details of components to be incorporated into Work including, but not limited to, the following:

1. Flashing System: Large-scale details for each element of flashing system showing layout, profiles, methods of joining, and anchorage details; including lintel units, shelf units, corner units, end dam units, drip edges, conditions showing interface and relationship to adjacent materials, and other special applications.

2. Fabricated Flashing: Detail corner units, end-dam units, drip edges, and other special applications.
3. Anchors, Ties, and Accessories: Show sizes, coursing, and locations.
4. Reinforcing: For masonry reinforcing bars; comply with ACI 315, "Details and Detailing of Concrete Reinforcement"showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement. Show elevations of reinforced walls.

1.07 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each type of masonry unit, cementitious materials, and accessories required. Include data on material propertiesmaterial test reports substantiating compliance with requirements. For brick, include test report for efflorescence according to ASTM C 67.
   1. Provide test reports based on testing within previous two years.

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 masonry unit.
   2. Cementitious materials. Include brand, type, and name of manufacturer. Provide certifications from manufacturer that no admixtures have been added to cementitious materials.
   3. Grout mixes. Include description of type and proportions of ingredients.
   4. Each material and grade indicated for reinforcing bars.
   5. Each type and size of joint reinforcement.
   6. Each type and size of anchors, ties, and metal accessory.

C. Mix Designs: Submit material test reports for the Owner’s Independent Testing and Inspection Agency, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content. Include description of type and proportions of mortar ingredients.
   2. Include test reports, according to ASTM C 1019 for grout mixes required to comply with compressive strength requirement. Include description of type and proportions of grout ingredients.

D. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Pre-Faced Units: 50 of each type, size, and color combination.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: The unit masonry work to be by a single firm specializing in exterior wall masonry work, for a period of not less than 5 years, so that there will be undivided responsibility in this single firm for such work.
   1. The Installer must be experienced with work comparable to the work shown and specified and who has completed projects with a successful in-service performance for a period of not less than 5 years.

2. The Installer shall engage experienced and qualified subcontractors to perform any part of the masonry work which he is not equipped or qualified to perform properly with his own forces.

B. Standards: Comply with the applicable provisions and recommendations of the following standards below, where standards conflict, the more stringent shall apply, and where a conflict between any stated standard and a project specific requirement of the specifications arise, the more stringent provision shall prevail.
   1. National Concrete Masonry Association (NCMA):"TEK" Information Series.
   2. American Concrete Institute (ACI):
      a. ACI 530/ASCE 5/TMS 402: "Building Code Requirements for Masonry Structures."
      b. ACI 530.1/ASCE 6/TMS 602: "Specifications for Masonry Structures."
   3. Brick Industry Association (BIA) "Technical Notes on Brick Construction."
   4. Underwriters Laboratories, Inc. (UL) "Fire Resistance Ratings."
   5. American Society for Testing and Materials (ASTM) E 2266 “Standard Guide for Design and Construction of Low-Rise FrameBuilding Wall Systems to Resist Water Intrusion.”

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, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

E. Owner’s Independent Testing and Inspection Agency: The Owner will engage a qualified independent testing and inspection agency to perform preconstruction testing indicated below for field quality control. Payment for these services will be made by Owner. Independent testing agency to coordinate submittal of "Special Inspections" testing documentation for State of Delaware (State) review and approval.
   1. The Contractor is responsible for the expense of testing or inspection resulting as a consequence of the following:
      a. Work not evidencing compliance with this specification.
      b. Testing to verify the adequacy of work done without prior notice, improper supervision, or contrary to standard construction practice.
   2. Contractor's Responsibilities:
      a. Furnish labor required to facilitate testing.
      b. Provide materials, samples and access to materials as required for testing.
      c. Provide a complete set of shop and erection drawings, including revisions to previous Architect reviewed submittals.
   3. Owner’s Independent Testing and Inspection Agency's Duties:
      a. The Owner’s Independent Testing and Inspection Agency shall conduct the following tests and inspections, interpret them, evaluate the results for compliance with the specifications, and report the findings to the Architect, Owner, Contractor, and Local Building Authority, as their interests may appear.
         1) Inspection and testing shall be in accordance with ACI requirements for masonry (ACI 530 and ACI 503.1) for the following inspections:
            (a) Observation, sampling and placing of masonry units used in all reinforced masonry construction.
            (b) Inspection reports during reinforced masonry erection.
            (c) Observations of reinforcement condition, size and placement for compliance with ACI 530.

(d) Ambient temperature during reinforced masonry erection.
(e) Inspection of reinforced masonry materials to verify compliance with ACI 530.1.
(f) Prism testing of masonry.
(g) Observation of proportioning, mixing, consistency of mortar and grout for compliance with ACI 530.1.
(h) Observation of application of mortar, grout and masonry units for compliance with ACI 530.1.
(i) Observation of installation of anchors for compliance with ACI 530.

b. Tests shall be conducted at the start of the job, using materials and mixes sampled at point of deposit.

c. Testing of Mortar: The Owner's Independent Testing Laboratory shall verify mix consistency by daily testing in accordance with ASTM C780. Test shall establish specific and overall performance characteristics of the mortar system. Test reports shall be submitted to the Owner / Architect for review under the provisions of the Division 01 section under "General Requirements".

d. Test of grout for reinforced masonry for compliance with ASTM C 476 requirements for the types specified and strength shown, conduct and report the following:
   1) Compressive strength (ASTM C 1019); lab cure and break at a time increment of one at 7 days, and two at 28 days; a minimum of 1 field test shall be made for each 5000 square feet of reinforced CMU wall. Make no less than 3 tests.

e. Preliminary Test of Concrete Masonry Design Strength: With sufficient time, and not less than 28 days prior to the start of reinforced masonry construction, test for the compressive concrete masonry design strength (f'm) as specified. The value of f'm shall be determined by tests of masonry assemblies (prisms) in accordance with ACI 530.1. Not less than five prisms shall be taken as 8 inches for reinforced CMU.

f. Field Tests of Concrete Masonry Design Strength: During construction, the value of the compressive concrete masonry design strength (f'm) shall be verified by field tests in accordance with the ACI and ASTM standards. A minimum of one field test shall be made for every 5000 square feet of reinforced CMU wall. Not less than three prisms shall be made for each field test. The thickness of the prisms shall be taken as 8 inches for the reinforced CMU.

F. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

1.09 MOCK-UP

A. Construct a masonry wall mock-up as shown in drawings. Include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.

B. Refer to Section 01 40 00 - Quality Requirements for additional information.

C. Locate where directed.

D. Mock-up may not remain as part of the Work.

E. Refer to Drawings for mockup configurations

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

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.
   1. Deliver masonry veneer units to the jobsite on covered banded pallets with cardboard between layers. Store pallets in single stacks on level ground and cover with waterproof covering to protect the units form inclement weather. Handle masonry veneer units carefully to avoid breakage and damage to the finished surfaces.

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. Deliver pre-blended dry mortar mix, if used for the project, in moisture-resistant containers designed for use with dispensing silos. Store pre-blended dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

F. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil. Do not use metal reinforcing or ties having loose rust or other coatings, including ice, that will reduce rust or destroy bond.

1.11 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. Prevent excess moisture from entering work in progress.
   1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
   2. Protect door and window frames and exposed metal flashings from damage.

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 metal reinforcing or ties having loose rust or other coatings that will reduce or destroy bond. 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 and ACI 530/ASCE 5 and the following requirements:
   1. If air temperature falls below 40 deg F, mixing water shall be heated.
   2. If the air temperature falls between 20 deg F and 32 deg F inclusively, sand and water shall be heated.

3. If the air temperature falls below 20 deg F, in addition to the requirements of the preceding sub-paragraph, masonry units shall be heated, and heated enclosures shall be used with a minimum temperature of 40 deg F.
4. Masonry shall be protected from freezing for 24 hours after laying.

D. Hot-Weather Requirements: When ambient temperature exceeds 100 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1.12 DEFINITIONS

A. Exterior: Areas exposed to the elements and areas located in unconditioned spaces

B. Interior: Areas located in conditioned spaces

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
2. Special Shapes: Provide non-standard blocks configured for corners, lintels, control joint edges, jambs, sash, acoustical units, and other detailed conditions.
3. Load-Bearing Units: ASTM C90, lightweight.
   a. Hollow block, as indicated.

B. Units with Integral Water Repellent: Provide exterior concrete block units as specified in this section with polymeric liquid admixture added to concrete masonry units at the time of manufacture.
1. Performance of Units with Integral Water Repellent:
   a. Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
      1) No water visible on back of wall above flashing at the end of 24 hours.
      2) No flow of water from flashing equal to or greater than 0.032 gallons per hour (0.05 L per hour) at the end of 24 hours.
      3) No more than 25 percent of wall area above flashing visibly damp at end of test.
   b. Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
   c. Compressive Strength: ASTM C1314; maximum 5 percent decrease.
   d. Drying Shrinkage: ASTM C1148; maximum 5 percent increase in shrinkage.
2. Use only in combination with mortar that also has integral water repellent admixture.
3. Use water repellent admixtures for masonry units and mortar by a single manufacturer.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
1. Basis of Design Manufacturer: Interstate
   a. Color 1: Mountain Red.
   b. Color 2: To be selected.
2. Actual size: 3 5/8" X 3 5/8" X 15 5/8".
3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect:
   a. Corner brick units (custom angle).
   b. Soldier course units with solid corners.

4. Substitutions: See Section 001600 - Product Requirements.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: not permitted.

B. Portland Cement: ASTM C150/C150M, Type Ior Type II, without air entrainment.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144: sand.

E. Grout Aggregate: ASTM C404.

F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As selected by Architect from manufacturer's full range.

G. Water: Clean and potable.

H. Accelerating Admixture: Not permitted.

I. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
   1. Use only in combination with concrete masonry units manufactured with integral water repellent admixture.
   2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
   3. Meet or exceed performance specified for water repellent admixture used in masonry units.
      a. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
      b. Master Builders, Inc.; Rheopel
      c. Amerimix, an Oldcastle brand; AMX 410: www.amerimix.com.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited: www.blok-lok.com.
   2. Hohmann & Barnard, Inc (including Dur-O-Wal brand): www.h-b.com.
   3. WIRE-BONDwww.wirebond.com/#sle.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa), deformed billet bars; uncoated.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Single Wythe Joint Reinforcement: Truss or ladder type; ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B; 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage on each exposure. . Provide in lengths of not less than 10 feet (3 m),with prefabricated corner and tee units.

E. Multiple Wythe Joint Reinforcement: Truss type; fabricated with moisture drip; ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/153M, Class B; 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage on each exposure. Provide in lengths of not less than 10 feet (3 m),with prefabricated corner and tee units.

F. Adjustable Multiple Wythe Joint Reinforcement: Truss type with adjustable ties spaced at 16 in (406 mm) on center ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/153M, Class B; 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods and adjustable components of 0.1875 inch (4.8 mm) wire; width of components as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage from each masonry face. Provide in lengths of not less than 10 feet (3 m),with prefabricated corner and tee units.
   1. Vertical adjustment: Not less than 3-1/2 inches (89 mm).

G. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face.
   1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch (6.3 mm) thick, with trapezoidal wire ties 0.1875 inch (4.75 mm) thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

H. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch (4.8 mm) thick, adjustable, eye and pintle type, stainless steel, sized to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in (32 mm).

I. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, Stainless Steel Wire: ASTM A 580/A 580M, AISI Type 304 and / or Stainless Steel Sheet: ASTM A 167, A 240, or A 666, AISI Type 316..
   1. Anchor plates: Not less than.093 inch (2.3 mm) thick, designed for fastening to structural backup through sheathing by two fasteners.
   2. Pintles: Trapezoidal, or rectangular shape shape, 0.1875 inch (4.75 mm) thick.
   3. Vertical adjustment: Not less than 2 inches (50 mm).
   4. Manufacturers:
      a. HB-200-X anchor by Hohmann & Barnard, Inc.(/www.h-b.com)

2.05 FLASHINGS

A. See Section 076200 - Sheet Metal Flashing and Trim.

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, duel level, trapezoidal shape and designed to prevent mortar droppings from clogging cavity weeps and allow proper cavity drainage.
   1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
      a. Manufacturers:
         1) Mortar Net Solutions; MortarNet with Insect Barrier: www.mortarnet.com.
      b. Locations: At flashing locations in brick veneer walls.

D. Cavity Weeps : Polyester mesh.

E. Steel Shelf Angles and Lintels: galvanized, see Section 05 12 00 - Structural Steel Framing and Section 05 50 00 - Metal Fabrications.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142inch (3.6mm) steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

2.07 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type N.
   4. Interior, loadbearing masonry: Type S.
   5. Interior, non-loadbearing masonry: Type N.

B. Mortar Type S: minimum 1800 psi, ASTM C 270.

C. Mortar Type N: One (1) part Portland Cement, one (1) part hydrated lime, and six (6) parts sand.

D. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

E. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm). Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 of ACI 530.1/ASCE 6/TMS 602 and ACI 530/ASCE 5 for dimensions of grout spaces and pour height. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

F. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

G. Mixing: Use mechanical batch mixer and comply with referenced standards.

2.08 SOURCE QUALITY CONTROL

A. Owner may engage a qualified independent testing agency to perform source quality-control testing indicated below. Payment for these services will be made by Owner.

B. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.

C. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 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. Use full size units without cutting, if possible.
   1. 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.
   2. Allow units to dry before laying unless wetting of units is specified.
   3. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets as they are placed.

D. Wetting of Brick:
   1. Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67.
   2. Allow units to absorb water so they are damp but not wet at time of laying.

E. Cover tops of all partially completed walls at end of day to protect completed work and prevent water from entering the cavity.

F. 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.

3.04 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.05 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Two units and two mortar joints to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.

3.06 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where wall tile is scheduled, cement parging is required, or resilient base is scheduled. Use square outside corners where wall tile is scheduled, corner guards are shown. Use bullnose outside corners at typical outside CMU corner.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.07 WEEPS

A. Install weeps in veneer and cavity walls at 16 inches (406 mm) on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

B. Place weeps directly on flashing.

C. Do not strike mortar across bottom of weep.
   1. If mortar is struck across weep, remove and replace weep.

3.08 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity full width of air space and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.09 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches (150 mm).

E. Reinforce joint corners and intersections with strap anchors 16 inches (400 mm) on center.

F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 16 inches (400 mm) horizontally and 16 inches (400 mm) vertically.

3.10 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches (400 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches (150 mm).

3.11 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches (400 mm) on center vertically and 16 inches (400 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches (400 mm) on center vertically and 16 inches (400 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

3.12 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Install horizontal joint reinforcement 16 inches (400 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches (150 mm).

E. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.

F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 16 inches (400 mm) horizontally and 16 inches (400 mm) vertically.

3.13 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches (152 mm), minimum, into adjacent masonry or turn up flashing ends at least 1 inch (25.4 mm), minimum, to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends with a minimum of two beads of continuous sealant from leading edge of horizontal surface across and up entire height of vertical/sloped surface. Seal penetrations of flashing before covering with mortar.
   4. Fold flashing to create end dams at discontinuous ends. Turn up one course.
   5. Seal penetrations of flashing materials at cast stone and other anchors with compatible sealant or mastic.

B. Terminate flashing up 8 inches (203 mm) minimum on vertical surface of backing:
   1. Install vertical leg of flashing behind water-resistive barrier over backing.
   2. Anchor vertical leg of flashing into backing with a termination bar and sealant.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Extend metal flashings flush with the exterior face of masonry. Install flashing in two beads of butyl joint sealer Type 3 below flashing to prevent moisture migration under flashing. Refer to Section 07 92 00 - Joint Sealants.

E. Support flexible flashings across gaps and openings.

F. Lap end joints of metal flashings at least 6 inches (152 mm) and seal watertight with Sealant Type 3.
   1. Refer to Sections 07 62 00 - Sheet Metal Flashing and Trim and 07 92 00 - Joint Sealants.

3.14 LINTELS

A. Refer to structural drawings for lintel requirements.

B. Install loose steel lintels over openings.

C. Maintain minimum 8 inch (200 mm) bearing on each side of opening.

3.15 GROUTED COMPONENTS

A. Reinforce bond beams as noted on the Contract Drawings.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches (300 mm) either side of opening.

F. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.16 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

C. Size control joints 3/8 inch wide and deep.

D. Form expansion joint as detailed on drawings.

3.17 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, window frames, anchor bolts, plates, and louvers and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.18 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch (6 mm).

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.

D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

3.19 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, grounds, and other items. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.20 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.21 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.22 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

SECTION 04 22 50
ARCHITECTURAL CONCRETE MASONRY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazed Masonry Units.

1.02 RELATED SECTIONS

A. Section 04060 - Masonry Mortar.

B. Section 04070 - Masonry Grout.

C. Section 04080 - Masonry Anchorage and Reinforcement.

D. Section 04092 - Embedded Flashing.

E. Section 04210 - Clay Masonry Units.

F. Section 04270 - Glass Unit Masonry.

G. Section 05500 - Metal fabrications; Loose Steel Lintels.

H. Section 07200 - Thermal Protection.

I. Section 07900 - Joint Sealers.

1.03 REFERENCES

A. ASTM C 90 - Standard Specification for Load-bearing Concrete Masonry Units.

B. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.

C. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

D. ASTM C 744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.

E. ASTM C 1262 - Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units

F. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. [Product Data <http://www.arcat.com/arcatcos/cos36/arc36111.cfm>]: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Manufacturer's Certificates: Certify that products meet or exceed specified requirements.

D. Selection Samples: For each block and finish specified, two complete sets of full size samples representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two full size samples representing actual product, color, and patterns.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, finishes, polishes and waxes.

1.05 QUALITY ASSURANCE

A. Fire Performance Characteristics: Where indicated, provide materials and construction which are identical to those of assemblies, equivalent thickness, whose fire endurance has been determined in compliance with ASTM E 119 by means acceptable to authorities having jurisdiction.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Construct a mock-up, no less than 4 feet by 4 feet by full thickness, of each type of unit and of each color and size to be used in the project.
   2. Locate mock-up panels in areas designated by Architect.
   3. Do not proceed with the work until workmanship, color, and finish is approved by Architect.
   4. Refinish mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Deliver masonry units to the jobsite on banded pallets with individual protective covers on each block face. Keep protective block covers on the blocks until installation..

C. Store pallets in single-stacks on level ground and cover with waterproof covering to protect the blocks from inclement weather. Handle blocks carefully to avoid breakage and damage to the finished surface

1.07 PROJECT CONDITIONS

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

B. Do not lay masonry units that are wet or frozen.

C. Remove ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.

D. Remove masonry damaged by freezing conditions.

E. Protect completed masonry and masonry not being worked on in the following manner. For grouted masonry, temperature ranges below apply to anticipated minimum night temperatures. For all other masonry, temperature ranges below apply to mean daily air temperature.
   1. 40 Degrees to 32 Degrees F (4.5 Degrees to 0 Degrees C): Protect masonry from rain or snow for at least 24 hours by covering with weather-resistant membrane.
   2. 32 Degrees to 25 Degrees F (0 Degrees to Minus 4 Degrees C): Completely cover masonry with weather-resistant membrane for at least 24 hours.
   3. 25 Degrees to 20 Degrees F (Minus 4 Degrees to Minus 6.7 Degrees C): Completely cover masonry with weather-resistant insulating blankets or similar protection for at least 24 hours; 48 hours for grouted masonry.
   4. 20 Degrees F and Below (Minus 6.7 Degrees C and Below):
      a. Except as otherwise indicated, maintain masonry temperatures above 32 degrees F (0 degrees C) for 24 hours, using enclosures and supplementary heat, electric heating blankets, infrared lamps, or other methods proven to be satisfactory.
      b. For grouted masonry, maintain heated enclosure to 40 degrees F (4.5 degrees C) for 48 hours.

F. Cover open walls to protect from wet conditions and damage from other trades that can stain or damage the finished masonry surfaces. Protect corners by covering with plywood.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Trenwyth Industries, which is located at: 1 Connelly Rd. P. O. Box 438 ; Emigsville, PA 17318; Toll Free Tel: 800-233-1924; Tel: 717-767-6868; Email: request info (info@trenwyth.com) <http://admin.arcat.com/users.pl?action=UserEmail&company=Trenwyth%20Industries&coid=36111&rep=&fax=&message=RE:%20Spec%20Question%20(04225tre):%20%20&mf=>; Web: www.trenwyth.com <http://www.trenwyth.com>

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

C. Obtain all exposed masonry units from one manufacturer for each individual product required.

2.02 GLAZED MASONRY UNITS

A. Astra-Glaze-SW+ and Astra-Glaze-SW+ Platinum:
   1. Glazed concrete blocks shall be lightweight units conforming to ASTM C 90.
   2. Glazed concrete blocks shall be medium weight units conforming to ASTM C 90.
   3. Glazed smooth satin-gloss finish, externally heat-polymerized cast-on facing conforming to ASTM C 744 and all applicable Federal Specifications.
   4. All units contain W.R. Grace DRY-BLOCK, an integral water-repellent CMU admixture at the time of manufacture.

B. Sizes and Shapes: Provide in the sizes indicated on the Drawings.
   1. Face Dimensions for standard 16 inch units with standard block thickness and for special block shapes:
      a. Nominal 2 inches (50 mm).
      b. Nominal 4 inches (102 mm).
      c. Nominal 6 inches (152 mm).
      d. Nominal 8 inches (204 mm).
      e. Nominal 10 inches (254 mm).
      f. Nominal 12 inches (305 mm).
   2. Face Dimensions for special block and for special block shapes:
      a. Nominal 16 by 16 inches (406 by 406 mm).
      b. Nominal 12 by 12 inches (305 by 305 mm).
      c. Nominal 8 by 16 inches (204 by 406 mm).
      d. Nominal 4 by 16 inches (102 by 406 mm).
      e. Nominal 8 by 8 inches (204 by 204 mm).
   3. Special block shapes:
      a. Stretchers.
      b. Cove Base.
      c. Jamb.
      d. Caps.
      e. 1 inch and 2 inch Shapes Series.
   4. Face Pattern:
      a. Plain Face.
   5. Semi-solid and solid units shall be used where specified and/or shown on the drawings.

C. Architect to Select colors required from the manufacturers standard range

D. Fire Resistance: Provide as indicated on the Drawings

2.03 MORTAR

A. Colored matching masonry units as supplied by block manufacturer. Refer to Division 4 Masonry Section for mortar type and specifications.

B. Contrasting mortar to masonry units as supplied by block manufacturer. Refer to Division 4 Masonry Section for mortar type and specifications.

C. Use W.R. Grace "Dry-Block" water-repellent mortar additive, supplied by block manufacturer in all exterior mortar.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until field conditions are acceptable and are ready to receive work.

B. Verify that items provided by other sections of work are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the architectural masonry units under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Lay units using the best concrete masonry practices. Install only quality units; reject all defective units. Align units level, plumb, and true to line and grade with uniform, carefully-tooled 3/8 inch wide joints on the finished face of the wall.

C. Tool joints neatly after they are finger-hard to ensure they are straight and uniform. Size and place cut pieces appropriately to maintain consistency and bond.

D. Draw blocks from more than one pallet at a time during installation. All exterior mortar shall include W.R. Grace "Dry-Block" water-repellent additive added to each batch in the appropriate dosage rates for mortar type (M,S or N) per manufacturer's instructions. Refer to NCMA TEK 3-1A for Hot and Cold weather construction practices.

E. Make all unit cuts, including those for bonding, holes, boxes, etc., with motor-driven masonry saws, using either an abrasive or diamond blade. Cut neatly and locate for best appearance.

F. Glazed-faced units shall be free from chips, cracks, crazes or any other imperfections that would detract from the overall appearance of the finished wall when viewed from a distance of five feet at right angles to the wall with normal lighting.

G. Mortar Bedding and Jointing:
   1. All exterior mortar joints must contain W.R. Grace "Dry-Block" water repellant additive or approved equal.
   2. Lay units with full mortar coverage on head and bed joints taking care not to block cores to be grouted or filled with masonry insulation.
   3. Tool all mortar joints when thumbprint hard into a concave configuration.
   4. Care should be taken to remove mortar from the face of masonry units before it sets.

5. Tuckpoint the joints of scored units for proper appearance. All exterior scored units must be tuckpointed to prevent water penetration. No raked joints should be used.
6. For glazed units, tool mortar joints to a minimum depth of 1/4 inch. Tuckpoint finish joint using a mortar gun with approved BONSAL Polymer Modified Sanded Tile Grout mixed with BONSAL B-7000 Epoxy, per manufacturer's instructions. Do not float grout across the glazed surface.

H. Install flashing at locations shown in the plans and in strict accordance with the details and the best masonry flashing practices.

I. Install weep holes and vents at proper intervals (32 inches O.C. and 2 inches long, above bed joints, typical) at courses above grade, above flashing, and at any water stops over windows, doors, and beams.

3.04 CLEANING

A. Glazed Units: Clean masonry units in accordance with the block manufacturers recommendations. Keep walls clean daily during installation using clean, damp cloth, brushes or rags. Harsh cleaning may mar the glazed surface.
   1. Do not allow excess mortar to harden on glazed surface. Remove green mortar with dry cloth. Do not use steel wool, sandpaper or other abrasive.
   2. Use masonry cleaners, such as Sure Klean 600 or Vanatrol, carefully following manufacturers instructions.
   3. Clean completed walls with a detergent cleaner, such as Pinsol or Fantastik, rinsing thoroughly. Do not use acid or abrasive on glazed surfaces.
   4. Do not use paint remover, lacquer thinner, methylene chloride, acetone or muriatic acid on glazed surface.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 04 72 00
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:
   1. Exterior wall units, including sills and keystones.
   2. Other items indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with masonry.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

D. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2009 (Reapproved 2015).

E. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

H. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

I. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

J. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

K. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Test results of cast stone components made previously by the manufacturer.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

D. Mortar Color Selection Samples.

E. Verification Samples: Pieces of actual cast stone components not less than 6 inches (152 mm) square, illustrating range of color and texture to be anticipated in components furnished for the project.

F. Source Quality Control Test Reports.

G. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
   2. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
   3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
   1. Any current producer member of the Architectural Precast Association.
   2. Any current producer member of the Cast Stone Institute.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by field experience.
   3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet (6 meters).
   4. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch (3 mm) or length divided by 360, whichever is greater, but not more than 1/4 inch (6 mm).
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.
      d. Specialty corner pieces; mitered corners not permitted.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Admixtures: ASTM C494/C494M.

E. Water: Potable.

F. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.

G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

I. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.

J. Mortar: Portland cement-lime, ASTM C270, Type N; do not use masonry cement.

K. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 00.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
   1. Drench cast stone components with clear, running water immediately before installation.
   2. Set units in a full bed of mortar unless otherwise indicated.
   3. Fill vertical joints with mortar.
   4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 CLEANING

A. Keep cast stone components clean as work progresses.

3.04 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

3.05 SCUEDULE

A. Provide window sills, keystones and other trim as shown.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 - **GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Structural steel.
2. Grout.

B. Related Sections include the following:

1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 5 Section "Steel Deck" for field installation of shear connectors.
3. Division 5 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.
4. Division 9 painting Sections for surface preparation and priming requirements.

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 ASD-service 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, Allowable Stress Design," Part 4

B. Construction: Type 2, simple framing.

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, fabricator, professional engineer, testing agency.

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.
3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD. If the fabricator does not have the AISC certification they can still bid the project but they are responsible to have a third party inspector inspect the fabrication process to ensure they are meeting AISC guidelines.

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

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

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

E. 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 "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
5. AISC's "Specification for Allowable Stress Design of Single-Angle Members”
6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Mockups: Build mockups of architecturally exposed structural steel to set quality standards for fabrication and installation.

1. Coordinate finish painting requirements with Division 9 painting Sections.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

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, M, S-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Corrosion-Resisting Structural Steel: ASTM A 588/A 588M, Grade 50 (345).

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Corrosion-Resisting Cold-Formed Hollow Structural Sections: ASTM A 847, structural tubing.

G. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

1. Weight Class: Standard, Extra strong, or Double-extra strong, as indicated.

2. Finish: Black, except where indicated to be galvanized.

H. Medium-Strength Steel Castings: ASTM A 27/A 27M, Grade 65-35 (Grade 450-240), carbon steel.

I. High-Strength Steel Castings: ASTM A 148/A 148M,Grade 80-50 (Grade 550-345), carbon or alloy steel.

J. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

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

1. Finish: Plain.

2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8,) compressible-washer type.

a. 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 or Hooked, as indicated.

2. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.

3. Plate Washers: ASTM A 36/A 36M carbon steel.

4. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.

5. Finish: Plain

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

1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.

2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
4. Finish: Plain

E. Threaded Rods: ASTM A 36/A 36M
1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
2. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
3. Finish: Plain

F. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.

G. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

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

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

C. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, 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 "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design
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, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

G. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure

removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated.

H. 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.

1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
   a. Grind butt welds flush.
   b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 3, "Power Tool Cleaning."

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 (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

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

D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

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 and shelf angles attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

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

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.

2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

3. Ultrasonic Inspection: ASTM E 164.

4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.

2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

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 "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

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 and architecturally exposed 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.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1].

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

I. 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 "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
   a. Grind butt welds flush.
   b. Grind or fill exposed fillet welds to smooth profile. Dress exposed 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: Shop-bolted connections will be tested and 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.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

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.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

END OF SECTION

SECTION 05 21 00
STEEL JOIST 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. K-series steel joists.
2. KCS-type K-series steel joists.
3. Joist accessories.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Division 04 Section "Unit Masonry" for installing bearing plates in unit masonry.

1.3 DEFINITIONS

A. SJI "Specifications" : Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

B. Design special joists to withstand design loads with live load deflections no greater than the following:

1. Roof Joists: Vertical deflection of 1/240 of the span.

1.5 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product indicated.

B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.

1. Indicate locations and details of bearing plates to be embedded in other construction.
2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

C. Welding certificates.

D. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.

E. Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.

F. Qualification Data: For manufacturer.

G. Field quality-control test and inspection reports.

H. Research/Evaluation Reports: For joists.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

A. Deliver steel bearing plates to be built into masonry construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.

B. Steel Bearing Plates: ASTM A 36/A 36M.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, uncoated.

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

1. Finish: Plain.

E. Welding Electrodes: Comply with AWS standards.

F. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20, ASTM A 780.

2.2 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists and KCS-type K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

D. Provide holes in chord members for connecting and securing other construction to joists.

E. Top-Chord Extensions: Extend top chords of joists a maximum of 1’-6” with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications" and meeting Total Allowable Load of 550 lb/ft and Allowable Live Load of 450 lb/ft.

F. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications" and meeting Total Allowable Load of 550 lb/ft and Allowable Live Load of 450 lb/ft.

G. Camber joists according to SJI's "Specifications." or as indicated.

H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability. Provide additional bridging as indicated on structural drawings.

B. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.

C. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface, unless otherwise indicated.

D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

D. Shop priming of joists and joist accessories is specified in Division 09 painting Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, 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 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.

2. Space, adjust, and align joists accurately in location before permanently fastening.

3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. Field welds will be visually inspected according to AWS D1.1/D1.1M.

C. In addition to visual inspection, field welds will be tested according to AWS D1.1/D1.1M and the following procedures, as applicable:

1. Radiographic Testing: ASTM E 94.
2. Magnetic Particle Inspection: ASTM E 709.
3. Ultrasonic Testing: ASTM E 164.
4. Liquid Penetrant Inspection: ASTM E 165.

D. Bolted connections will be visually inspected.

E. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."

F. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

G. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 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, bearing plates, abutting structural steel, and accessories.

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

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 053100
STEEL DECK

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" for shop- and field-welded shear connectors.
3. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
4. Division 09 painting Sections for repair painting of primed deck.
5. Division 16 Section "Underfloor Raceways" for preset inserts, activation kits, after set inserts, service fittings, header ducts, and trench header ducts used with cellular floor-deck systems.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Field quality-control test and inspection reports.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

G. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

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

C. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.

2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

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

E. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

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.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

1.6 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 07 to ensure protection of insulation strips against damage from effects of weather and other causes.

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. 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. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
   a. Color: Manufacturer's standard
2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 zinc coating.
3. Deck Profile: As indicated.
4. Profile Depth: As indicated.
5. Design Uncoated-Steel Thickness: As indicated.
6. Span Condition: Triple span or more.
7. Side Laps: Overlapped.

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 G60 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
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. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile As indicated.

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

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (1.52 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and sloped recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.

K. 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.

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

M. 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.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

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.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

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: 5/8 inch (16 mm) 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 18 inches (450 mm) apart, maximum or as indicated.

3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches (910 mm)], and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped 2 inches (51 mm) minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches (305 mm) apart with at least one weld or 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. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Division 07

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: 5/8 inch (16 mm) nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location.

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 (910 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm)with end joints as follows:

1. End Joints: Lapped

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.

F. Install piercing hanger tabs at 14 inches (355 mm) apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides, unless otherwise indicated.

3.5 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. 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. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on **both surfaces** of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09 Section.

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

END OF SECTION

SECTION 05 40 00
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.
3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

1.4 SUBMITTALS

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

B. Shop Drawings: Design cold form framing walls per the applicable design loading & provide signed & sealed shop drawings by a Registered Professional Engineer in the State of Delaware indicating stud sizes, gauges, spacing, and connections / attachments to adjoining work.

C. Welding certificates.

D. Qualification Data: For testing agency.

E. 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. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

F. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

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

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

E. 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. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

F. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

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:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. AllSteel Products, Inc.
2. Craco Metals Manufacturing, LLC.
3. Dale/Incor.
4. Dietrich Metal Framing; a Worthington Industries Company.
5. MarinoWare; a division of Ware Industries.
6. United Metal Products, Inc.

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

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

1. Grade: As Indicated & designed by CFMF engineer.

2. Coating: G60 (Z180).

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

1. Grade: 50 (340), Class 1 or 2.

2. Coating: G60 (Z275).

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: 18 gauge at full height walls supporting metal panel / siding & 16 gauge at full height walls supporting masonry veneer. Final design to be performed & provided by CFMF manufacture's design professional engineer.

2. Section Properties: As Indicated

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: 18 gauge

2. Flange Width: As Indicated

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:

2. Manufacturers: Subject to compliance with requirements, provide products by one of 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.

D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

a. Minimum Base-Metal Thickness: 18 gauge

b. Flange Width: As Indicated.

2. Inner Track: Of web depth indicated, and as follows:

a. Minimum Base-Metal Thickness: 18 gauge

b. Flange Width: As Indicated

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

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. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated.

C. 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.

D. 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.

E. 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.

F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

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 welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. 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 welding, 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 (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) 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 (3 mm).

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

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

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 shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. 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 welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

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

F. 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.

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

H. 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.

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

J. 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 (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) 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 by CFMF engineer with maximum 16” o/c.

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. Install double deep-leg deflection tracks and anchor outer track to building structure.
2. Connect vertical deflection clips to bypassing studs and anchor to building structure.
3. Connect drift clips to cold formed metal framing 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 (1220 mm) apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   a. Install solid blocking at centers indicated.
2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. 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.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

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 FIELD QUALITY CONTROL

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

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 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

SECTION 05 44 00
COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-formed steel trusses for roofs.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.

2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. Delegated-Design Submittal: For cold-formed steel trusses.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product test reports.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified 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, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Aegis Metal Framing.
2. Genesis Worldwide Inc.
3. Marino/WARE.
4. Nuconsteel, A Nucor Company.
5. Steel Construction Systems.
6. TrusSteel; an ITW company.
7. USA Frametek.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
   a. Roof Trusses: Vertical deflection of 1/360 of the span.
3. Design framing systems to provide for movement of framing members located outside the insulated building envelope 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 (67 deg C).

C. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: Design according to AISI S210.
2. Lateral Design: Design according to AISI S213.
3. Roof Trusses: Design according to AISI S214.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 COLD-FORMED STEEL TRUSS MATERIALS

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

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

1. Grade: As required by structural performance.
2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90).

2.4 ROOF TRUSSES

A. Roof Truss Members: Manufacturer's standard C-shaped steel sections.

1. Connecting Flange Width: 1-5/8 inches (41 mm), minimum at top and bottom chords connecting to sheathing or other directly fastened construction.

2. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm) or as required for design.
3. Section Properties: As required for design

2.5 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 truss members.

B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and Appendix D in ACI 318, greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Fasteners: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. 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.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.

B. Shims: Load bearing, of high-density multimonomer plastic, nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

2.8 FABRICATION

A. Fabricate cold-formed steel trusses 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 trusses using jigs or templates.
2. Cut truss members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses 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 (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) 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 (3 mm).

PART 3 - EXECUTION

3.1 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.2 INSTALLATION

A. Install, bridge, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened.

1. Fasten cold-formed steel trusses by welding or mechanical fasteners.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings; comply with requirements for spacing, edge distances, and screw penetration.

C. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

D. Truss Spacing: 48 inches (1220 mm) or as indicated.

E. Do not alter, cut, or remove framing members or connections of trusses.

F. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

G. Erect trusses without damaging framing members or connections.

H. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.

I. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's TechNote 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses.".

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform inspections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Field and shop welds will be subject to testing and inspecting.

D. Prepare test and inspection reports.

3.4 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 trusses are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated metal items as scheduled herein.

B. Shop fabricated steel, aluminum, and metal items.

C. Prefabricated ladders

D. Downspout boots.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 051200: Structural steel anchor bolts and related work.

D. Section 05 5100 - Metal Stairs.

E. Section 05 52 13 - Pipe and Tube Railings.

F. Section 09 9000 - Paints and Coatings

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

H. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

I. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

J. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

K. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

L. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

M. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

N. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

O. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2012.

P. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric); 2012.

Q. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

R. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

S. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

T. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

U. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

V. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.

W. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

X. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

Y. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design fabricated items under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Delaware.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500, Grade B cold-formed, or ASTM A 501 hot-formed, structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black and hot-dip galvanized finish, as indicated.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy, T6 temper.

D. Bolts, Nuts, and Washers: Stainless steel.

E. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

A. Supply and install metal fabrications listed below complete with anchorage and attachments necessary for installation.

B. Steel lintels:
   1. Provide hot dip galvanized loose steel lintels in masonry. Lintels shall be provided for all exterior masonry veneer openings and as shown on the drawings. Bear lintels 8" on masonry at each jamb.
   2. Refer to structural drawings for sizes.

C. Angle support for vanity:
   1. Provide welded steel angle supports for vanities.
   2. Secure to walls by bolting or screwing into blocking in walls.
   3. Prepare for attachment of wood blocking and plastic laminate as specified elsewhere and shown on the drawings.

D. Elevator shaft hoist beam: Size per structural drawings.

E. Elevator sill angles:
   1. Provide 5" x 5" x 5/16" sill angles at each elevator entrance.
   2. Secure to floor structure and fill with grout as directed on the elevator shop drawings

F. Elevator pit ladder: Provide elevator pit ladder where shown on the drawings.
   1. Ladder shall extend a min. of 4'-0" above finished floor.

2. Provide 2-1/2" x 1/2" continuous structural steel flat bar side rails with eased edges, spaced 1'-6" apart.
3. Rungs shall be 1" square solid rungs with non-slip surface on top of each rung.
   a. Coat rung with aluminum oxide granules set in epoxy resin or use a type of manufactured rung which is filled with aluminum oxide grout.
   b. Fit rungs in centerline of side rails, plug weld and grind smooth on outer face of rail.
4. Support ladder at top and bottom.
   a. Use brackets designed for adequate support and anchorage; weld to rails.
   b. Hold ladder min. 7" clear of wall to centerline of rungs.

G. Metal Roof Ladders:
1. Manufacturer: O'Keeffe's, Inc.; 325 Newhall St. San Francisco, CA 94124. ASD. (888) 653-3333. http://www.okeeffes.com.
   a. Substitutions: See Section 016000
2. Exterior Fixed Roof Ladders: Tubular Rail Low Parapet Access Ladder with Platform and Return.
   a. Model 503 as manufactured by O'Keeffe's Inc.
   b. Walk-Through Rail and Roof Rail Extension: Not less than 3 feet 6 inches (1067 mm) above the landing and shall be fitted with deeply serrated, square, tubular grab rails.
   c. Landing Platform: 1-1/2 inches (38 mm) or greater diameter, tubular aluminum guardrails and decks of serrated aluminum treads.
3. Interior Fixed Roof Ladders: Heavy Duty Tubular Rail Access Ladder.
   a. Model 501 as manufactured by O'Keeffe's Inc.
4. Ladder Materials
   a. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.
   b. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.
5. Ladder finish: Clear Anodic Finish: AA-M10C22A41 Mechanical finish as fabricated. Architectural Class I, clear coating 0.018 mm or thicker.
6. Rungs: Not less than 1-1/4 inches (32 mm) in section and 18-3/8 inches (467mm) long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
   a. Rungs shall withstand a 1,500 pound (454 kg) load without deformation or failure.
7. Provide ladder cage for ladder runs 20 feet or greater.
8. Provide intermediate brackets in order to keep maximum bracket spacing at 10 feet on center. For exterior roof ladders, provide mounting bracket to wall to keep ladder rails above roof.
9. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.

H. Dunnage, railings and working platforms for chillers: Provide, as shown on the drawings, galvanized steel support rails, working platform and railings for rooftop chillers.

I. Steel edge angle at overhead coiling doors: size and configuration as shown; hot-dipped galvanized.

J. Steel channel frame at overhead coiling doors: size and configuration as shown; hot-dipped galvanized.

2.05 MANUFACTURED PRODUCTS

A. Supply and install metal fabrications listed below complete with anchorage and attachments necessary for installation.

B. Ornamental bollards at walkway areas: removable.

C. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.
   1. 6" G-90 galvanized standard weight steel pipe.
   2. Fill with 3,000 psi concrete.
   3. Slightly overfill top for drainage.
   4. Bollard Cover:
      a. High Density Polyethylene (HDPE) post cover
      b. Color: Yellow
      c. Product Model No.: CL1686FF
      d. Manufacturer: Post Guard, distributed by Global Insdutrial.

D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of masonry; galvanized finish.

2.06 DOWNSPOUT BOOTS

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
   1. Configuration: Offset.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Finish: Manufacturer's standard factory applied powder coat finish.
   4. Color: To be selected by Architect from manufacturer's standard range.
   5. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, and rubber coupling.
   6. Manufacturers:
      a. Downspoutboots.com, a division of J. R. Hoe & Sons; O Series: www.downspoutboots.com.
      b. Neenah Foundry, a division of Neenah Enterprises, Inc; Model R-4929-O6C: www.nfco.com.

2.07 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete or masonry.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft (530 g/sq m) galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.08 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I natural anodized.

B. Interior Aluminum Surfaces: Class I natural anodized.

C. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

D. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.09 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on drawings and/or on shop drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 51 00
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior ornamental stairs.

B. Interior exit stairs.

C. Structural steel stair framing and supports.

D. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 50 00 - Metal Fabrications.

D. Section 05 52 13 - Pipe and Tube Railings: Metal handrails and balusters other than specified in this section.

E. Section 03 48 00 - Pre-cast Concrete treads and risers

F. Section 09 9000 - Paints and Coatings

1.03 REFERENCE STANDARDS

A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.

B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2016.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

I. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.

J. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

L. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; 2002.

M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

O. NAAMM AMP 510 - Metal Stairs Manual; 1992, Fifth Edition.

P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

Q. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.04 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

B. Design Data: As required by authorities having jurisdiction.

C. Welders' Certificates.

D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of Delaware, or personnel under direct supervision of such an engineer.

B. Drawing review: Structural Engineer of Record will review shop drawings for conformance with the contract documents and the loads specified. Corrections to the shop drawings required by Engineer's review shall not constitute a change in contract amount for pricing and detailing.

C. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

D. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

E. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
      a. Refer to structural drawings for stair construction notes and design loads.
   4. Dimensions: As indicated on drawings.

5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
7. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
1. Architectural (Stair A): All joints as inconspicuous as possible, whether welded or mechanical.
   a. Welded Joints: Continuously welded and ground smooth and flush.
   b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
   c. Exposed Edges and Corners: Eased to small uniform radius.
   d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
2. Commercial (Stair B): Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair is covered by soffit IS NOT considered exposed to view.
   a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
   b. Welds Exposed to View: Ground smooth and flush.
   c. Mechanical Joints: Butted tight, flush, and hairline.
   d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
   e. Exposed Edges and Corners: Eased to small uniform radius.
   f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH PRECAST CONCRETE TREADS AND RISERS (STAIR A)

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with precast concrete tread.
1. Precast Concrete Tread Thickness: 1-1/2 inches (38 mm), minimum, see Section 034800.
2. Precast Concrete Treads:
   a. Concrete Strength: 5,000 psi (35 MPa) at 28 days, minimum.
   b. Air Content: 4 to 6 percent.
   c. Cement Color: Natural gray.
   d. Aggregate Color: As required to make finished product match Architect's sample.
3. Tread Pan Material: Steel sheet.
4. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch (1.9 mm) minimum.
5. Pan Anchorage to Stringers: Continuously welded, from top or bottom.

D. Risers: Same material and thickness as tread pans.
1. Riser/Nosing Profile: As shown on drawings.

E. Stringers: Steel plate.
1. Stringer Depth: As indicated on drawings.

F. Landings: Similar construction, using corrugated steel decking, supported and reinforced as required to achieve design load capacity.

G. Railings: As indicated on drawings.

H. Guards - As shown on drawings.

I. Finish: Shop- or factory-prime painted.

J. Under Side of Stair: Not exposed to view.

2.03 EXIT STAIR (STAIR B)

A. Jointing and Finish Quality Level: Commercial.

B. Risers: Closed.

C. Treads: Metal pan with concrete fill..
   1. Concrete Depth: 2 inches (50 mm).
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch (1.9 mm) minimum.
   4. Pan Anchorage to Stringers: Continuously welded, from top or bottom.
   5. Concrete Reinforcement: None.
   6. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
   1. Riser/Nosing Profile: Vertical riser with underside of nosing sloped up from bottom of tread pan at not less than 60 degrees from horizontal, with rounded top of nosing of minimum radius.
   2. Nosing Depth: Not more than 1 inch (____ mm) overhang.
   3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch (12 mm) wide.

E. Stringers: Rolled steel channels.
   1. Stringer Depth: 12 inches (305 mm).
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Similar construction, using corrugated steel decking for concrete fill, supported and reinforced as required to achieve design load capacity.

G. Railings: As shown on drawings and specified below.

H. Guards - As shown on drawings and specified below.

I. Finish: Shop- or factory-prime painted.

J. Under Side of Stair: Exposed to view.

2.04 HANDRAILS AND GUARDS

A. Guards:
   1. Top Rails: Stainless steel, round pipe unless otherwise indicated.
      a. Outside Diameter: 1-1/2 inch (_____ mm), minimum, to 2 inches (____ mm), maximum.
   2. Infill at Picket Railings: Vertical pickets.
      a. Horizontal Spacing: Maximum 4 inches (100 mm) on center.
      b. Material: Solid steel bar.
      c. Shape: Square.
      d. Size: 1/2 inch (12 mm) square.
      e. Top Mounting: Welded to steel channel at underside of top rail.
      f. Bottom Mounting: Welded to 1-1/2" square bottom rail.
   3. End and Intermediate Posts: Square tube.
      a. Horizontal Spacing: As required to meet design loads.

b. Mounting: Welded to top surface of stringer.

2.05 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

E. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Designation CS (commercial steel); SS (Structural), Grade 33.
   2. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Designation CS (commercial steel); SS (Structural), Grade 33, Type1.

F. Concrete Fill: Type specified in Section 03 30 00.

2.06 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Steel Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1.

C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.07 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: Two.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 73 13
ARCHITECTURAL GLASS RAILING

PART 1 -- GENERAL

1.01 SCOPE OF WORK

A. Fabricate and install architectural glass railings in accordance with the requirements set forth in this section.

1.02 ADDITIONAL WORK INCLUDED IN THIS SECTION

A. Reinforcing for wall rail brackets at dry wall partitions.

B. Field measuring for weld plates, sleeves and insert locations.

C. Field measuring.

D. Anchors or inserts for terrazzo or precast concrete.
   1. The following items are not to be included in the metal rail contractor's work:
   2. Temporary shoring or bracing
   3. Demolition and removal of existing work
   4. Clean up of existing construction prior to installation of stairs
   5. Cleaning out of stair wells
   6. Cutting; preparation of pockets; setting of plates, inserts, carpenter hardware or any other built ins
   7. Temporary lights and electricity
   8. Temporary safety rails after erection
   9. Field painting
   10. Final cleaning and protection of aluminum, stainless steel, bronze and glass

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Section 03 30 00: Cast-in-Place Concrete

B. Section 03 40 00: Precast Concrete

C. Section 04 20 00: Unit Masonry

D. Section 05 12 00: Structural Steel Framing

E. Section 08 80 00: Glazing

F. Section 09 20 00: Plaster and Gypsum Board Assemblies

G. Section 09 90 00: Painting and Coating

1.04 STRUCTURAL REQUIREMENTS

1.05 THE STRUCTURAL ADEQUACY OF THE METAL STAIR DESIGN IS THE RESPONSIBILITY OF THE DESIGNER OR PROFESSIONAL OF RECORD.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Furnish references listing projects of similar size and scope

1.07 REGULATORY REQUIREMENTS

A. Regulatory Requirements
   1. Components and installation are to be in accordance with state and local code authorities
   2. Components and installation are to follow current ADA and ICC/ANSI A117.1 guidelines.
      a. Determine code regulations that govern this work. Specify requirements and drawings that are necessary to meet governing codes.

B. Certifications
   1. Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.
   2. Furnish certification that components were installed in accordance to the manufacturer's engineering data to meet the specified design loads.

C. Pre-Installation Meeting
   1. Prior to the beginning of work, conduct a pre-job conference at the job site.
   2. Provide seven calendar days advance written notice ensuring the attendance by competent authorized representatives of the fabricator, building owner's representative, architect and subcontractors whose work interfaces with the work of this section.
   3. Review the specifications to determine any potential problems, changes, scheduling, unique job site conditions, installation requirements and procedures and any other information pertinent to the installation.
   4. Record the results of the conference and furnish copies to all participants.

1.08 REFERENCES

1.09 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section [01 30 00] [01 34 00].
   1. Show sections and plans of stairs, dimensions and assembly of components.
      a. Railings
      b. Handrail
      c. Brackets
      d. Reinforcements
      e. Anchors
      f. Welded and bolted connections
         1) Show all field connections
         2) Provide setting diagrams for installation of anchors, location of pockets, weld plates for attachment of rails to structure, and blocking for attachment of wall rail.
         3) Specify adequate back up support for anchoring handrail bracket.
         4) Indicate all required field measurements.

B. Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.

C. Submit manufacturer's installation instructions under provisions of Section [01 30 00] [01 34 00].

D. Samples:
   1. Submit duplicate samples of railing showing style and finish. One approved sample will be returned to contractor.
   2. Certificates:
      a. Furnish manufacturer's certification that materials meet specification requirements.

1.10 - OR -

A. Furnish [certification] [and] [or] [calculations] by an engineer registered in the state where the project is located showing that safety requirements are met.

B. This requirement should be included only if called for by contract documents.

C. Substitutions:

1. Any changes in specified material must meet requirements of the General Conditions "or equal" clause. (See #_____)
2. Indicate Section and Paragraph of the General Conditions that sets out "or equal" requirements.
3. Changes in architectural details to fabricator's standard procedures will be allowed when appearance and strength are not affected.
   a. State any alternatives that affect the work and/or bid price of this section, such as a change in material or a change to contractor's standard details.

1.11 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.

B. Storage on site:
1. Store material in a location and in a manner to avoid damage. Stacking shall be done in a way, which will prevent bending.
2. Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.
3. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Railing [pipe] [tube] and components shall be as manufactured or supplied by The Wagner Companies; P.O. Box 423; Butler, WI 53007. Phone: 888-243-6914. Fax: 414-214-0550. Web site: www.wagnercompanies.com. E-mail: info@mailwagner.com <mailto:info@mailwagner.com>.

2.02 MATERIALS AND FINISHES

A. Aluminum:
1. Extruded Pipe: Alloy [6061-T6] [6063-T52] [6063-T6] meeting ASTM B 221
2. Extruded Bars, Shapes and Mouldings: Alloy [6063-T52] [6063-T6] meeting ASTM B 221
3. Castings: Almag 35 meeting ASTM B 26
4. Finish (refer to NAAMM/NOMMA Metal Finishes Manual):
   a. Anodized finish shall be [AA-M10-C22-A31 (204R1)] [provided in accordance with AA-M___ -C ___-A___] and shall meet requirements of AAMA (606.1) (607.1) (608.1).
   b. Painted finish shall be _____ type and _____ color and shall meet the requirements of AAMA 605.1 specification for high performance organic coatings.

B. Stainless Steel: Type [304] [316] [_____]
1. Bar: ASTM A 167
2. Pipe and Tubing: ASTM [A 269] [A 312]
3. Finish: [Ornamental Grade, AISI No. 4] [AISI No.___].

C. Copper Alloys:
1. Drawn Pipe: C23000 (Red Brass), ASTM B 43
2. Drawn Tube: C27000
3. Sheet: C28000 (Muntz Metal)

4. Castings: [C83600] [C86500] meeting ASTM B 584 for sand castings]
5. Finish (refer to NAAMM/NOMMA Metal Finishes Manual):
   a. Mechanical: [M32-Medium Satin] [M__- _____]
   b. Chemical: C _____ - _____
   c. Coating:
   d. [Clear Organic: O _____ - _____]
   e. Laminated: L _____ -_____]
   f. [Wax: _____]
   g. [Oil: _____]

D. Steel:
1. Bars: meeting ASTM A 36.
2. Finish (refer to NAAMM/NOMMA Metal Finishes Manual):
   a. Surface Preparation: Remove loose scale, rust, grease, oil, moisture or other foreign materials to properly prepare the surface for subsequent coating application.
      1) Remove mill scale, rust and dirt following SSPC SP2 for hand cleaning and SSPC SP3 for power tool cleaning.
         (a) Galvanizing:
            (1) Products fabricated from shapes, plates, bars and strips shall be galvanized in accordance with ASTM A 123.
            (2) Sheet products shall be galvanized in accordance with ASTM A 525 and ASTM A 526.
            (3) Minimum coating weight ___ oz/sq. ft.
         (b) Paint:
            (1) Minimum one coat of rust-inhibitive primer _____, [FS-TT-P-641 Zinc Dust-Zinc Oxide Primer Coating (for Galvanized Surfaces)] [FS-TT-P-645 Alkyd Type, Zinc Chromate, Paint Primer]
            (2) Painted finish shall be _____ type and _____ color.
         (c) Touch up for Galvanized Surfaces: Use paint primer meeting FS-TT-P-645.

E. Glass:
1. Fully tempered ASTM C 1048 Kind FT quality q3 conforming to the safety requirements of ANSI Z97.1.
2. Laminated, [fully tempered] [heat strengthened], ASTM C 1172, with [PVB] [rigid] interlayer.
3. Tint: [None] [Gray] [_____].

2.03 RAILING SYSTEM

A. Material shall conform to 2.02. and be finished in accordance with 2.02.

B. Railing system shall be [surface] [flush] [fascia] mounted.

C. Rails: Fabricate rails from [aluminum] [brass] [stainless steel] Wagner No. _____

D. Posts: Fabricate posts from [_____] inch outside diameter by [_____] inch wall [aluminum] [bronze] [brass] [stainless steel] tubing.

E. Glass Structural Balustrade shall be [1/2] [3/4] inch tempered glass and conform to the safety requirements of ANSI Z97.1.

F. Shoe Moulding: Extruded aluminum alloy Wagner No. _____

G. Cladding [aluminum] [brass] [stainless steel], Wagner No. _____.

H. Fittings: Shall be of wrought material of [aluminum] [brass] [stainless steel].

I. Glazing Accessories:
   1. Protective insert shall be of polyvinyl chloride (PVC); Wagner No. GR939__.
   2. Dry Glaze:
      a. Wagner [PanelGrip™ No. PG2450] [GlassWedge™ No. (GR9500) (GR9750)]
      b. Shoe Moulding insert [GR9300] [GR9398] [GR9354]
         1) Wet Glaze:
            (a) Setting block shall be Wagner No. [GR9392] [GR9393].
            (b) Filler: [Rockite] [Type _____ ; Color: _____]
            (c) Shoe Moulding insert [GR9396] [GR9398]

2.04 FASTENERS

A. All mechanical fasteners used in the assembly of stainless steel or aluminum railings shall be manufactured from stainless steel.

B. Exposed mechanical fasteners for use with bronze materials shall be manufactured from yellow brass.

C. Cement: Hydraulic, ASTM C 595, factory prepared with accelerator.

2.05 HANDRAIL BRACKETS

A. [Aluminum] [Bronze] [Stainless steel]; [cast] [extruded] [stamped] [machined]: Wagner No. _____
   1. Check governing codes for dimensional and structural requirements.

2.06 FABRICATION

A. Form [rail-to-end post connections and] all changes in rail direction by [miter] [radius] elbows.

B. Cut material square and remove burrs from all exposed edges, with no chamfer.

C. Make exposed joints butt tight and flush.

D. Close exposed ends of [pipe] [handrail] by use of appropriate end cap.

E. For posts set in concrete, furnish matching sleeves or inserts not less than 5 inches long.

F. Locate intermediate rails [midway] [equally spaced] between top rail and finished floor or center line of tread.

G. Verify dimensions on site prior to shop fabrication.

PART 3 -- EXECUTION

3.01 PREPARATION

A. Supply items to be [cast in concrete] [embedded in masonry] [placed in partitions].

3.02 METAL INTERACTION

A. When bronze and aluminum components come into contact with dissimilar metals, surfaces shall be kept from direct contact by painting the dissimilar metal with [a heavy coat of a proper primer] [asphalt paint].

B. When aluminum components come into contact with cement or lime mortar, exposed aluminum surfaces shall be painted with [heavy bodied bituminous paint] [water-white methacrylate lacquer] [zinc chromate].

3.03 INSTALLATION

A. Install in accordance with shop drawings [and manufacturer's instructions] at locations indicated on the drawings.

B. Erect work [square and level,] [horizontal or parallel to rake of steps or ramp,] rigid, [and] free from distortion or defects detrimental to appearance or performance.

C. Expansion joints shall be provided as needed to allow for thermal expansion or contraction.

3.04 CLEANING

A. As installation is completed, wash thoroughly using clean water and soap; rinse with clean water.

B. Do not use acid solution, steel wool or other harsh abrasives.

C. If stain remains after washing, remove finish and restore in accordance with NAAMM/NOMMA Metal Finishes Manual.

D. Finish must not be removed from anodized aluminum. Reanodizing can only be done by removing railing and returning it to the anodizer.

3.05 REPAIR OF DEFECTIVE WORK

A. Remove stained or otherwise defective work and replace with material that meets specification requirements.

B. Repair damaged finish as directed by Architect

C. Replace defective or damaged components as directed by Architect.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roofing nailers.

B. Preservative treated wood materials.

C. Fire retardant treated wood materials.

D. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.

B. Section 07 25 00 - Weather Barriers: Air barrier over sheathing.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

E. PS 1 - Structural Plywood; 2009.

F. PS 20 - American Softwood Lumber Standard; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Evaluated Materials Program (EAP); www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing: Plywood, PS 1
   1. Bond Classification: Exterior.
   2. Span Rating: 32.
   3. Performance Category: 5/8 PERF CAT.

B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

C. Other Applications:
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
   3. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
   1. Manufacturers:
      a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
      b. Hoover Treated Wood Products, Inc: www.frtw.com.
      c. Koppers, Inc: www.koppers.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat plywood panels that are a substrate for PVC trim.
      c. Treat other rough carpentry items as indicated.
      d. Do not use treated wood in direct contact with the ground.
   3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated .
      c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Manufacturers:
      a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
      b. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber in contact with flashing or waterproofing.
      c. Treat lumber in contact with masonry or concrete.
      d. Treat lumber less than 18 inches (450 mm) above grade.
      e. Treat lumber in other locations as indicated.

f. Treat lumber used for wood blocking within cavity wall construction..

3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
   a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
   b. Treat plywood in contact with flashing or waterproofing.
   c. Treat plywood in contact with masonry or concrete.
   d. Treat plywood less than 18 inches (450 mm) above grade.
   e. Treat plywood in other locations as indicated.
   f. Treat plywood used for wood blocking within cavity wall construction..

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.
   10. TV and monitor mounts.

3.03 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Roof and Wall Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. At long edges provide solid edge blocking where joints occur between roof framing members.
2. Screw panels to framing; staples are not permitted.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.05 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.06 CLEANING

A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 066500 - Plastic Simulated Wood Trim

C. Section 12 3600 - Countertops, Backsplashes and Window Stools: Solid Surface material.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.03 SUBMITTALS

A. Product Data:
   1. Provide data on fire retardant treatment materials and application instructions.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

C. Samples: Plastic laminate for finish selection.

D. Samples: Solid Surface for finish selection

E. Samples: Submit two samples of wood trim 12 inch (____ mm) long.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: White Maple; prepare for transparent finish.
   2. Wall panels: White maple veneer plywood; prepare for transparent finish.
   3. Window Stools and Aprons: Solid Surface Material.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LUMBER MATERIALS

A. Hardwood Lumber: White Maple species, quarter sawn, maximum moisture content of 6 percent, of quality suitable for transparent finish.

2.04 SHEET MATERIALS

A. Hardwood Plywood: Face species White Maple, quarter cut, book matched, medium density fiberboard core; HPVA HP-1, Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.05 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3, HGS; color as selected by Architect; satin finish.

B. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate.

C. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.06 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Concealed Joint Fasteners: Threaded steel.

2.07 ACCESSORIES

A. Primer: as specified in Section 09 90 00.

B. Wood Filler: Solvent base, tinted to match surface finish color.

2.08 WOOD TREATMENT

A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

B. Wood Preservative by Pressure Treatment (PT Type): Provide AWPA U1 treatment using waterborne preservative with 0.25 percent retainage.

C. Shop pressure treat wood materials requiring fire rating to concealed wood blocking.

D. Provide identification on fire retardant treated material.

E. Redry wood after pressure treatment to maximum 10 percent moisture content.

2.09 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)

E. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2.10 SHOP FINISHING

A. Apply wood filler in exposed nail and screw indentations.

B. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 11, Polyurethane, Catalyzed.
      b. Sheen: Satin.

D. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Hang doors and install hardware.

B. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.

C. Set and secure materials and components in place, plumb and level.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

E. Install interior wood trim with finish nails or finish screws, set for filler.

F. Install solid surface window stools.

3.03 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.04 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Before installation, prime paint surfaces of wood items or assemblies to be in contact with cementitious materials.

3.05 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 07 11 13
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bituminous dampproofing.

B. Protection boards.

C. Drainage panels.

1.02 REFERENCE STANDARDS

A. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2016).

B. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).

C. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013.

1.03 SUBMITTALS

A. Product Data: Provide properties of primer, bitumen, and mastics.

B. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with at least three years of experience.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 BITUMINOUS DAMPPROOFING

A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.

1. Composition - Vertical Application: ASTM D1227 Type III or ASTM D1187/D1187M Type I.
2. VOC Content: Not more than permitted by local, State, and federal regulations.
3. Applied Thickness: 1/16 inch (1.5 mm), minimum, wet film.
4. Products:
   a. W. R. Meadows, Inc; Sealmastic Emulsion Type I (spray-grade): www.wrmeadows.com/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

2.02 BITUMEN MATERIALS

A. Cold Asphaltic Type:

1. Bitumen: Emulsified asphalt, ASTM D1227;unreinforced (Type III).

2. Asphalt Primer: ASTM D41/D41M, compatible with substrate.

2.03 ACCESSORIES

A. Drainage Panel: 1/4 inch (6 mm) thick formed plastic, hollowed sandwich.

B. Protection Board: 1/8 inch (3 mm) thick biodegradable hardboard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.03 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

C. Prime surfaces at a rate approved by manufacturer for application indicated, and allow primer to dry thoroughly.

D. Apply bitumen by spray application.

E. Apply bitumen in one coat, continuous and uniform, at a rate of 25 sq ft/gal (0.6 sq m/L) per coat.

F. Apply from 2 inches (50 mm) below finish grade elevation, or below first course of face brick, down to top of grade beam at locations where two or more CMU courses are below grade.

G. Seal items watertight with mastic, that project through dampproofing surface.

H. Place drainage panel directly over dampproofing, butt joints, place to encourage drainage downward.

I. Place protection board over drainage panel, butt joints, and adhere with mastic.

J. Scribe and cut boards around projections, penetrations, and interruptions.

END OF SECTION

SECTION 07 13 00
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet Waterproofing:
   1. Self-adhered modified bituminous sheet membrane.
   2. Self-adhered HDPE sheet membrane.

B. Drainage panels and protection board.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete substrate.

B. Section 04 2000 - Unit Masonry: CMU substrate.

C. Section 07 92 00 - Joint Sealants: Sealing moving joints in waterproofed surfaces that are not required to be treated in this section.

1.03 ABBREVIATIONS

A. HDPE - High-Density Polyethylene.

B. NRCA - National Roofing Contractors Association.

1.04 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

D. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2010).

E. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008 (Reapproved 2015).

F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

G. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 1993 (Reapproved 2014).

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

I. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).

J. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until liquid or mastic accessories have cured.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 MEMBRANE MATERIALS

A. Self-Adhered Modified Bituminous Sheet Membrane:
1. Thickness: 60 mil, 0.060 inch (1.5 mm), minimum.
2. Sheet Width: 36 inch (0.914 m), minimum.
3. Tensile Strength:
   a. Film: 5000 pounds per square inch (34.57 MPa), minimum, measured according to ASTM D882 and at grip-separation rate of 2 inches (50 mm) per minute.
   b. Membrane: 325 pounds per square inch (2.24 MPa), minimum, measured according to ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches (50 mm) per minute.
4. Elongation at Break: 300 percent, minimum, measured according to ASTM D412.
5. Water Vapor Permeance: 0.05 perm (2.9 ng/(Pa s sq m)), maximum, measured in accordance with ASTM E96/E96M.
6. Low Temperature Flexibility: Unaffected when tested according to ASTM D1970/D1970M at minus 20 degrees F (minus 11 C), 180 degree bend on 1 inch (25 mm) mandrel.
7. Peel Strength: 7 pounds per inch (1226 N/m), minimum, when tested according to ASTM D903.
8. Lap Adhesion Strength: 5 pounds per inch (875.6 N/m), minimum, when tested according to ASTM D1876.
9. Puncture Resistance: 50 pounds (22.67 kg), minimum, measured in accordance with ASTM E154/E154M.
10. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.

11. Hydrostatic Resistance: Resists the weight of 200 feet (61 m) when tested according to ASTM D5385/D5385M.
12. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
13. Manufacturers:
    a. Carlisle Coatings & Waterproofing Inc; MiraDRI 860/861: www.carlisleccw.com/#sle.
    b. GCP Applied Technologies; Bituthene: www.gcpat.com.
    c. Henry Company; Blueskin WP 200: www.henry.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Self-Adhered HDPE Sheet Membrane: Recommended by manufacturer for placement below concrete slabs and on outside face of below grade walls before placement of concrete.
1. Sheet Thickness: 46 mil (0.046 inch) (1.2 mm), minimum.
2. Low Temperature Flexibility: Unaffected when tested according to ASTM D1970/D1970M at minus 20 degrees F (minus 11 C), 180 degree bend on 1 inch (25 mm) mandrel.
3. Hydrostatic Resistance: Resists the weight of 231 feet (70 m) when tested according to ASTM D5385/D5385M.
4. Elongation at Break: 500 percent, minimum, measured according to ASTM D412.
5. Tensile Strength, Film: 3,500 pounds per square inch (24 MPa), minimum, measured according to ASTM D412.
6. Lap Peel Adhesion: 5 pounds per inch (875 N/m), minimum, when tested according to ASTM D1876.
7. Water Vapor Permeance: 0.01 perm (0.6 ng/(Pa s sq m)), maximum, measured in accordance with ASTM E96/E96M.
8. Bond to Concrete: 5 pounds per inch (875 N/m), minimum, per ASTM D903.
9. Lateral Water Migration Resistance: Resists the weight of 231 feet (70 m) when tested according to ASTM D5385/D5385M.
10. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
11. Manufacturers:
    a. GCP Applied Technologies; Preprufe 300R: www.gcpat.com/#sle.
    b. W. R. Meadows: PRECON: www.wrmeadows.com.
    c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Seaming Materials: As recommended by membrane manufacturer.

D. Membrane Sealant: As recommended by membrane manufacturer.

2.02 ACCESSORIES

A. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.

B. Protection Board: Provide type capable of preventing damage to waterproofing due to backfilling and construction traffic.

C. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
1. Composition: Dimpled polystyrene core; polypropylene filter fabric.
2. Products:
    a. Epro Services, Inc; ECODRAIN-MS: www.eproserv.com/#sle.

b. Mar-flex Waterproofing & Building Products; ArmorDrain 150: www.mar-flex.com/#sle.
c. Mar-flex Waterproofing & Building Products; ArmorDrain 400 Protection/Drainage Board: www.mar-flex.com/#sle.

D. Flexible Flashings: Type recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.

E. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.

F. Prepare building expansion joints at locations as indicated on drawings.

G. Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.

D. Overlap edges and ends, minimum 3 inches (76 mm), seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

H. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.

B. Place protection board directly against drainage panel; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.

C. Adhere protection board to substrate with compatible adhesive.

3.05 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall.

B. Batt insulation in exterior wall construction.

C. Acoustical insulation in interior acoustically rated partitions.

D. Fire safing insulation at fire partitions and perimeter firestopping at curtain walls.

1.02 RELATED REQUIREMENTS

A. Section 07 26 40 - Spray Polyurethane Foam Insulating Air Barrier: Plastic foam insulation other than boards.

B. Section 07 53 00 - Elastomeric Membrane Roofing: Insulation specified as part of roofing system.

1.03 REFERENCE STANDARDS

A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation types are:
   1. Type 1 - Batt/blanket insulation - unfaced.
   2. Type 2 - Batt/blanket insulation with vapor barrier (NOT USED).
   3. Type 3 - Perimeter insulation - rigid.
   4. Type 4 - Cavity wall insulation - rigid.
   5. Type 4A - Cavity wall insulation - mineral fiber
   6. Type 5 - Acoustical insulation.
   7. Type 6 - Fire safing insulation.
   8. Type 7 - Spray polyurethane foam insulation.

B. Insulation Type 3 at Perimeter of Foundation: Extruded polystyrene board.

C. Insulation Type 7 inside Masonry Cavity Walls (Typical): Spray Polyurethane Foam, Refer to Section 07 2640.

D. Insulation Type 7 over sheathing and metal stud framed walls, continuous (Typical): Spray Polyurethane Foam, Refer to Section 07 2640.

E. Insulation Type 4A where indicated Exterior Walls: Mineral Fiber

F. Insulation Type 1 in Metal Framed Walls: Batt insulation with no vapor retarder.

G. Insulation Over Roof Deck: Polyisocyanurate board. Refer to Section 07 5300.

H. Acoustical Insulation Type 5 in sound rated partitions.

I. Fire safing insulation Type 6 at voids and penetrations of fire separations and smoke walls.
   1. For terminations of rated CMU partitions to deck above.

J. Ventilated composite roof insulation.
   1. Refer to Section 07 3113. For asphalt shingle steep sloped roofs.
   2. Refer to Section 07 6100. For sheet metal roofs.

2.02 FOAM BOARD INSULATION MATERIALS

A. Type 3 and Type 4: Extruded Polystyrene Board Insulation: Extruded polystyrene board; ASTM C578; with either natural skin or cut cell surfaces, and the following characteristics:
   1. Type: ASTM C578, Type VI.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. R-value (RSI-value); 1 inch (25 mm) of material at 72 degrees F (22 C): 5 (0.88), minimum.
   5. Board Edges: Square.
   6. Water Absorption, Maximum: 0.3 percent, by volume.
   7. Manufacturers:

a. Dow Chemical Company; STYROFOAM HIGHLOAD 40: www.dowbuildingsolutions.com/#sle.
b. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FIBERBOARD INSULATION MATERIALS

A. Mineral Fiber Board Cavity Insulation Type 4A:
1. Manufacturer: Roxul CavityRock DD
2. Type: mineral wool fiber insulation board.
3. Edges: square.
4. Size: 16" x 48".
5. Thickness: as shown on drawings.
6. Thermal resistivity (r-value): 4.3 per inch thickness per ASTM C 518.
7. Water vapor permeance: 27.2 perm per ASTM E 96.
8. ASTM compliance: ASTM C 612 Type IVB.

B. Mineral Fiber Board Insulation Type 6: Rigid or semi-rigid mineral fiber, ASTM C612 or ASTM C553; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
1. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
2. Manufacturers:
a. ROCKWOOL (ROXUL, Inc); CURTAINROCK 80: www.rockwool.com/#sle.
b. ROCKWOOL (ROXUL, Inc); CURTAINROCK 40: www.rockwool.com/#sle.
c. ROCKWOOL (ROXUL, Inc); ROXUL SAFE 65: www.rockwool.com/#sle.

2.04 BATT INSULATION MATERIALS

A. Type 1 and Type 5 Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
2. Manufacturers:
a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
b. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.
c. ROCKWOOL (ROXUL, Inc); AFB evo™: www.rockwool.com/#sle.

2.05 ACCESSORIES

A. Insulation Fasteners: Impaling clip of nylon with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

B. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of irregularities or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards vertically and/or horizontally on foundation perimeter as shown.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

A. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.
   2. Butt edges and ends tightly to adjacent boards and to protrusions.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 FIELD QUALITY CONTROL

A. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
   1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
   2. Notify in ABAA writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

3.06 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 21 29
SPRAYED ACOUSTICAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass insulation placed in walls.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2015.

B. ASTM C739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation; 2011.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on materials, describing insulation properties.

C. Certificates: Certify that products of this section meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. Manufacturer's Qualification Statement.

F. Submit manufacturer's written certification that product contains no asbestos, fiberglass or other man-made mineral fibers.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1.05 MOCK-UP

A. Provide room mock-up, 10 feet (____ m) long by 10 feet (____ m) wide miniumum, illustrating ceiling construction.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver in original, unopened containers bearing name of manufacturer, product identification and reference to U.L. testing.

B. Store materials dry, off ground, and under cover.

C. Protect liquid adhesive from freezing.

1.07 FIELD CONDITIONS

A. Maintain acceptable ambient and substrate surface temperatures prior to, during, and after installation of primer and insulation materials and overcoat.

B. Clips, hangers, supports, sleeves and other attachments to spray bases are to be placed by other trades prior to the application of sprayed insulation.

C. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of sprayed insulation.

D. Roof penetrations to be installed prior to application.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cellulosic Fiber Sprayed Insulation:
   1. International Cellulose Corp; K-13 Spray-On-Systems: www.spray-on.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Cellulose Fiber Insulation: ASTM C739; treated cellulose fiber, color as selected from manufacturers standard range.
   1. Thickness: 2 inches, unless otherwise noted.
   2. Acoustical performance: NRC of 0.95 (ASTM C 423)

B. Material to have been tested in accordance with ASTM E 1042. Testing laboratory must be NVLAP accredited.

C. Product shall meet or exceed the following requirements:
   1. Bond strength shall be greater than 100 psf per ASTM E 736.
   2. Product shall be Class 1 Class A per ASTM E 84/ UL 723.
   3. Non-corrosive per ASTM C 739.
   4. Bond Deflection per ASTM E 759: 6” Deflection in 10’ Span - No Spalling or Delamination.
   5. R-Value to be 3.75 per inch per ASTM C518.
   6. Comply with IBC 803.3/2009 IBC 803.10 stability requirements for interior finishes.
   7. Meet ASTM C 1149

D. Product shall not contain any added Urea-Formaldehyde Resins.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are clean, dry, and free of matter that may inhibit adhesion.

B. Verify that ceiling hangers and supporting clips have been are installed correctly.

C. Verify other work on and within spaces to be insulated is complete prior to application.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from overspray or damage.

B. Apply primer in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install sprayed insulation in accordance with manufacturer's instructions.

B. Install sprayed insulation to a uniform monolithic density without voids.

C. Install to a minimum cured thickness of 2 inch (____ mm)es.

3.04 PROTECTION

A. Do not permit subsequent construction work to disturb applied sprayed insulation.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate.

B. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls, and roof assemblies water vapor resistant and air tight.

C. Air Barriers: Materials that form a system to stop passage of air and water vapor through exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls, and roof assemblies.

1.02 RELATED REQUIREMENTS

A. Section 072616- Underslab VaporBarrier.

B. Section 07 26 40 - Spray Polyurethane Foam Insulating Air Barrier: Insulation and air barrier in exterior walls.

C. Section 076200 - Sheet Metal Flashing and Trim: Membrane flashings installed in conjunction with weather barriers.

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture-resistant, to the degree specified, intended to be installed to shed water, with sealed seams.

1.04 REFERENCE STANDARDS

A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

G. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.

1.06 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.07 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.

1. Use water-resistive barrier sheet, mechanically fastened unless otherwise indicated.

B. Air Barrier:

1. On outside surface of gypsum sheathing of exterior walls where Spray Polyurethane Foam Insulating Air Barrier is not indicated, use air barrier sheet, self-adhesive type.
2. On outside surface of roof decking under mineral fiber insulation at mansards, use vapor retarder sheet, self-adhesive type.

2.02 WATER-RESISTIVE BARRIER MATERIALS

A. Water-Resistive Barrier Sheet, Mechanically Fastened:

1. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
2. Water Vapor Permeance: 5 perms (286 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
3. Water Penetration Resistance: Withstand a water head of 21 inches (55 cm), minimum, for minimum of 5 hours, when tested in accordance with AATCC Test Method 127.
4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.

5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
6. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES AC38.
7. Manufacturers:
   a. DuPont Building Innovations; Tyvek Commercial Wrap D with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: www.dupont.com/#sle.
   b. HardieWrap, HardieWrap Seam Tape, HardieWrap Flex Flashing: www.jameshardie.com..
   c. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 AIR BARRIER MATERIALS (AIR BARRIER, VAPOR PERMEABLE, AND WATER-RESISTIVE)

A. Air Barrier Sheet (Walls): ASTM D1970.
1. Type: Self-adhered vapor permeable, water resistive air barrier consisting of a reinforced, modified polyolefin tri-laminate film surface and patented permeable adhesive technology with split-back poly-release film.
2. Thickness: 23 mil (___ mm), nominal.
3. Water Vapor Permeance: 29 perm (___ ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M.
4. Air Permeance: Pass (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
5. Manufacturers:
   a. Henry Company; Blueskin VP 160: www.henry.com/sle..
   b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 AIR BARRIER MATERIALS (AIR BARRIER, VAPOR RETARDER, AND WATER-RESISTIVE)

A. Air Barrier Sheet (Roofs): ASTM D1970.
1. Type: Modified bitumen membrane reinforced with skid-resistant polyethylene film, self-adhesive.
2. Thickness: 40 mil (0.040 inch) (1.02 mm), nominal.
3. Water Vapor Permeance: 0.05 perm (2.87 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M.
4. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
5. Products:
   a. Henry Company; Blueskin RF200: www.henry.com.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 AIR BARRIER COATING (ALTERNATIVE AIR BARRIER PRODUCT FOR CMU WALLS):

A. Material: Water-based acrylic.

B. Acceptable Substrates: Stated by manufacturer as suitable for installation on visibly damp surfaces and concrete that has hardened but is not fully cured ("green" concrete) without requiring a primer.

C. Dry Film Thickness: 55 mils (1.4 mm), minimum.

D. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.

E. Water Vapor Permeance: 0.025 perms (_____ ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M, Procedure B.

F. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 3 months weather exposure.

G. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.

H. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

I. VOC Content: 100 g per L or less.

J. Sealants, Tapes and Accessories: As recommended by coating manufacturer.

K. Products:
   1. Henry Company; Air-Bloc 33MR: www.henry.com/sle.
   2. Parex USA, Inc.; Parex USA WeatherSeal Trowel-on (without gauging aggregate): www.parexusa.com.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 SEALANTS

A. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.07 ADHESIVES

A. Mastic Adhesive : Compatible with sheet seal and substrate, thick mastic of uniform knife grade consistency .

2.08 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

C. Pre-formed Transition Membrane: Semi-rigid silicone or polyester composition, tapered edges, tear resistant.

D. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water and with sealed seams and with sealed joints to adjacent surfaces.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

F. Mechanically Fastened Sheets - On Exterior:
   1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
   2. Overlap seams as recommended by manufacturer but at least 6 inches.
   3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).
   4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches (305 to 460 mm) on center along each framing member supporting sheathing.
   5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape.
   6. Install air barrier and vapor retarder UNDER jamb flashings.
   7. Install head flashings under weather barrier.
   8. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

G. Self-Adhered Sheets:
   1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
   2. Lap sheets shingle-fashion to shed water and seal laps air tight.
   3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
   4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
   5. At wide joints, provide extra flexible membrane allowing joint movement.

H. Coatings:
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
   3. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch (6 mm); use sheet seal to join to adjacent construction, seal air tight with sealant.
   4. Use flashing to seal to adjacent construction and to bridge joints.

I. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
   2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.

3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Coordination of ABAA Tests and Inspections:
1. Provide testing and inspection required by ABAA QAP.
2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

C. Do n ot cover installed weather barriers until required inspections have been completed.

D. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 26 16
UNDER-SLAB VAPOR BARRIER/RETARDER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

1.02 RELATED SECTIONS

A. Section 03 3000 Cast-in-Place Concrete

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E 1745-97(2004) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
   2. ASTM E 154-99(2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
   3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials
   4. ASTM E 1643-98(2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

1.04 SUBMITTALS

A. Quality Control / Assurance
   1. Independent laboratory test results showing compliance with ASTM & ACI Standards.
   2. Manufacturer's samples, literature
   3. Manufacturer's installation instructions for placement, seaming and pipe boot installation

PART 2 - PRODUCTS

2.01 MATERIALS

A. Vapor Barrier
   1. Vapor Barrier must have the following qualities
      a. Perm rating less than or equal to 0.01 perms (grains/(ft2 *hr * in. Hg)) after conditioning as tested by:
         1) ASTM E 96
         2) ASTM E 1745 Class A (Plastics), paragraph 7.1.2-5.

B. Vapor Barrier Products: 15 mil plastic sheet - single ply vapor barrier.
   1. Stego Wrap (15 mil) Vapor Barrier by STEGO INDUSTRIES LLC, San Clemente, CA (877) 464-7834 www.stegoindustries.com
   2. Griffolyn 15 mil Green Vapor Barrier by Reef Industries, Inc.
   3. VaporBlock 15 by Raven Industries, Inc.
   4. ACCESSORIES
      a. Seam Tape
         1) Tape must have the following qualities:
            (a) Water Vapor Transmission Rate ASTM E 96: 0.3 perms or lower
      b. Vapor Proofing Mastic
         1) Mastic must have the following qualities:
            (a) Water Vapor Transmission Rate ASTM E 96: 0.3 perms or lower
      c. Pipe Boots

1) Provide manufacturer's supplied pipe boot system or construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ensure that subsoil is approved by architect or geotechnical firm
   1. Level and tamp or roll aggregate, sand or tamped earth base.

3.02 INSTALLATION

A. Install Vapor Barrier/Retarder:
   1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643.

B. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.

C. Lap Vapor Barrier/Retarder over footings and seal to foundation walls.

D. Overlap joints 6 inches and seal with manufacturer's tape.

E. Seal all penetrations (including pipes) per manufacturer's instructions.

F. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.

G. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION

SECTION 07 26 40
SPRAY POLYURETHANE FOAM INSULATING AIR BARRIER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section includes the following:
   1. Materials and installation to bridge and seal the following air leakage pathways and gaps:
      a. Connections of the walls to the roof air barrier.
      b. Connections of the walls to the foundations.
      c. Openings and penetrations of window frames.
      d. Barrier envelope systems.
      e. Door frames.
      f. Piping, conduit, duct and similar penetrations
      g. Masonry ties, screws, bolts and similar penetrations.
      h. All other air leakage pathways in the building envelope.

1.02 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

A. Sheet metal flashings to be built into masonry are furnished under Section 07 62 00.

1.03 RELATED SECTIONS

A. Section 04 2000 - Unit Masonry:

B. Section 07 2100 - Building Insulation.

C. Section 07 9200 - Joint Sealants: Joint sealant materials and installation.

D. Section 08 11 13- Door frames.

E. Section 08 51 13 - Aluminum Windows

F. Section 08 43 13 Aluminum storefronts and entrances

G. Section 08 44 13 - Glazed Aluminum Curtain Walls

1.04 PERFORMANCE REQUIREMENTS

A. Provide air/vapor barrier system constructed to perform as follows:
   1. A continuous air/vapor barrier system.
   2. Building thermal insulation.

B. System shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air seal materials at such locations, changes in substrate and perimeter conditions.

C. Maximum Permissible Air Leakage Rates cfm/sf @ 0.3" w.g. (l/s.m2 @ 75 Pa)
   1. 0.02 (0.1)

1.05 SUBMITTALS

A. Provide submittals in accordance with Section 01 3000.

B. Submit shop drawings showing locations and extent of air/vapor barrier and details of all typical conditions, intersections with other envelope systems and materials, membrane flashings and counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.

C. Submit manufacturer's product data sheets for each type of material, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other

limitations of installation conditions, technical data, and tested physical and performance properties.

D. Submit manufacturer's installation instructions.

E. Provide evidence of testing by an accredited laboratory confirming material has been tested and conforms to the requirements of ASTM E2178, Standard for Air Barrier Materials.

F. Certification by air/vapor barrier manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

G. Certification of compatibility by air/vapor barrier manufacturer, listing all materials on the project that it connects to or that come in contact with it.

H. Submit two samples, 12 by 12 inch (300 by 300 mm) minimum size, of each air/vapor barrier material required for Project.

I. Submit test results of air permeability testing of primary air barrier material (ASTM E 2178-01).

J. Provide evidence of testing by an accredited laboratory confirming material has been tested and conforms to the requirements of ASTM E2357, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies: Pass.

K. Provide evidence of testing by an accredited laboratory confirming material has been tested and conforms to the requirements of NFPA 285: Pass.

L. Quality Assurance Program: Submit evidence of current accreditation and certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program. Submit accreditation number of manufacturer and certification number of installers at time of submittal.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Each worker who is installing air barriers must be either a Certified Applicator or an installer who is registered with ABAA
   2. Each Lead Certified Applicator can supervise a maximum of five registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air barriers of the types being applied. Lead Certified Applicators shall perform or directly supervise all air/vapor barrier work on the project.
   3. Installers shall also be certified by ABAA/NECA (National Energy Conservation Association) and PSDI (Professional Skills Development Institute for energy conservation) and SPFA (Spray Polyurethane Foam Alliance as foam mechanics). Installers shall have their photo-identification certification cards in their possession and available on the project site, for inspection upon request.
   4. Provide products that comply with all state and local regulations controlling use of volatile organic compounds (VOCs).
   5. Preconstruction Meeting: Convene one week prior to commencing Work of this section, in accordance with Section 01 20 00 - Project Meetings.
   6. Field-Constructed Mock-Ups: Prior to installation of air/vapor barrier, apply air/vapor barrier as follows to verify details under shop drawing submittals and to demonstrate tie-ins with adjoining construction, and other termination conditions, as well as qualities of materials and execution:
      a. Apply air/vapor barrier in field-constructed mock-ups of assemblies specified in Section 04 2000.

7. Cooperate and coordinate with the Owner's inspection and testing agency if required. Do not cover any installed air and vapor barrier unless it has been inspected, tested and approved per requirements.
8. Protect people and materials from over-spray and contact with chemicals and gases.

1.07 FIELD QUALITY ASSURANCE

A. Implement the ABAA Quality Assurance Program requirements. Cooperate with ABAA inspectors and independent testing and inspection agencies engaged by the Owner. Do not cover air barrier until it has been inspected, tested, and accepted.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, expiration date, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air/vapor barrier manufacturer. Protect stored materials from direct sunlight.

C. Avoid spillage. Immediately notify Owner, Architect if spillage occurs and start clean up procedures.

D. Clean spills and leave area as it was prior to spill.

1.09 WASTE MANAGEMENT AND DISPOSAL

A. Place materials defined as hazardous or toxic waste in designated containers.

B. Ensure emptied containers are sealed and stored safely for disposal away from children.

1.10 PROJECT CONDITIONS

A. Environmental Conditions: Apply air/vapor barrier within range of ambient and substrate temperatures recommended by air/vapor barrier manufacturer. Do not apply air/vapor barrier to a damp or wet substrate, unless the manufacturer specifically permits that for the product.
   1. Do not apply air/vapor barrier in snow, rain, fog, or mist.
   2. Do not apply air/vapor barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.
   3. The product shall not be installed after the expiry date printed on the label of each container. The product has a shelf life of 6 months from the date of manufacture.

1.11 WARRANTY

A. System Warranty: Provide the manufacturer's three year system warranty, including the primary air/vapor barrier and installed accessory sealant and membrane materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.01 MATERIALS & MANUFACTURERS

A. Sprayed polyurethane foam material, when tested, shall meet the requirements of ULC S705.1-01 Standard for Thermal Insulation-Spray Applied Rigid Polyurethane Foam, Medium Density, Material- Specification.

B. A copy of an Evaluation Report (such as the CCMC Evaluation Report) or copies of the test reports from an accredited testing laboratory, for each physical property, indicating that the product meets the requirements of ULC S705.1-01 shall be made available upon request.

C. Material containers shall be labeled with the Evaluation Report number of the evaluation agency.

D. Design R-value as indicated in test report; minimum R6.9/inch.

E. Density as indicated in test report: minimum 1.7 pounds per cubic foot.

F. Smoke development as indicated in test report; less than 500 when tested under ULC S102.

G. Products that meet the preceding requirements:
   1. Basis-of-design product: Walltite closed cell spray foam polyurethane air/vapor barrier as manufactured by BASF (215-966-1168).

H. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another manufacturer with approved submittal meeting the design criteria:
   1. Icynene: www.icynene.com

I. Substitutions: See Section 01 60 00 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended by air/vapor barrier manufacturer for intended use and compatible with the air/vapor barrier.

B. Transition Membrane: Self-adhering, smooth surfaced SBS modified bitumen membrane, nominal 40 mil thickness, width as required, to detail all rough openings, changes in material substrates, and penetrations.
   1. Blueskin SA as manufactured by Henry Company Inc
   2. Butyl-based peel and stick membrane: Transition between air/vapor barrier membrane and TPO or EPDM membranes:
      a. Blueskin SA as manufactured by Henry Company Inc.
   3. Primer: Water based liquid primer for concrete, masonry, gypsum sheathing, wood, metal, and painted substrates;
      a. Aquatac as manufactured by Henry Company Inc.
   4. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes approved by foamed in place air/vapor barrier manufacturer.
   5. Sheet Membrane Transition Strip Termination Sealant:
      a. BES 925 Sealant by Henry Company Inc.
   6. Sheet Membrane Sheet Membrane Air Barrier Perimeter Seal to Windows, Doors: Low modulus silicone sheet; provide manufacturer's standard system consisting of precured low-modulus silicone extrusion, in sizes to fit widths indicated, combined with a neutral-curing low modulus silicone sealant for bonding extrusions to substrates.
      a. Pecora Sil-Span.
      b. Dow 1-2-3 or equal.
   7. Provide sealants in accordance with Section 07 92 00 - Joint Sealants. Comply with ASTM C920 and ASTM C920 classifications for type, grade, class, and uses.
      a. Silicone Sealant: natural cure, low modulus, to seal sheet membrane flashing to polyethylene face of sheet rubberized-asphalt barrier and to seal between and to non-bituminous sheet systems.
         1) Acceptable materials:
            (a) Dow 790
            (b) Pecora 864
      b. SPF (Sprayed Polyurethane Foam) Sealant: Provide one- or two-component, foamed-in-place, polyurethane foam sealant with the following characteristics:

1) Density: 1.5 to 2.0 PCF.
2) Flame Spread (ASTM E162): 25 or less.
3) Initial R-Value (at 1 inch): Not less than 7.
4) Acceptable materials:
   (a) Zerodraft Foam Sealant.
   (b) Zerodraft Insulating Air Sealant
   Zerodraft (Division of Canam Building Envelope Specialists Inc.), 125 Traders Blvd. E., Unit # 4, Mississauga, ON, L4Z 2H3 Tel. 1-877-272-2626

c. Substrate Cleaner: Non-corrosive compatible with adjacent materials.

C. Intumescent Coating
1. International Fireproof Technology Inc. DC-315: water-based, intumescent paint, conforming to the following:
   a. Product shall pass full scale fire resistance test with spray foam insulating air barrier in accordance with NFPA 286: 24 wet mils (thermal barrier).
   b. Finish: flat, grey color
   c. VOC Content: 47 g/L
   d. Volume Solids: 67%
   e. Flash Point: none
   f. Mechanism of cure: coalescence
   g. Reducer/cleaner: water

2.03 EQUIPMENT

A. The equipment used to spray the polyurethane foam material shall be in accordance with ULC S705.2-02 and the equipment manufacturer's recommendations for specific type of application.

B. Equipment settings are to be recorded on the Daily Work Record as required by the ULC S705.2-02 Installation standard.

C. Each proportioner unit to supply only one spray gun.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions under which air/vapor barrier systems will be applied, with Installer present, for compliance with requirements. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
1. Ensure that:
   a. surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants
   b. concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
   c. masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.
   d. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
   e. Notify Architect in writing of anticipated problems using air/vapor barrier over substrate.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air/vapor barrier application.

B. Prime ICBP metal substrates with conditioning primer when installing modified asphalt membrane transition membranes.

C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air/vapor barrier and at protrusions according to air/vapor barrier manufacturer's written instructions.
   1. Verify that surfaces and conditions are suitable to accept work as outlined in this section.
   2. Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.
   3. Examine joints before sealing to ensure configurations, surfaces and widths are suitable for spray polyurethane foam. Report in writing all defects stating the locations of joints deemed unacceptable for the application of the spray polyurethane foam.

3.03 PREPARATION

A. Protection:
   1. Mask and cover adjacent areas to protect from over spray.
   2. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
   3. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
   4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.
   5. Surface Preparation
      a. Surfaces to receive foam insulation shall be clean, dry and properly fastened to ensure adhesion of the polyurethane foam to the substrate.
      b. Ensure that all work by other trades that may penetrate through the air barrier system is in place and complete.
      c. Ensure that surface preparation and any primers required conform to the manufacturer's instructions.
      d. Prepare surfaces by brushing, scrubbing. Scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion and integrity of the spray polyurethane foam. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the spray polyurethane foam. Ensure surfaces are dry before proceeding.
      e. Install transition membranes around and into all rough openings, to all materials penetrating the exterior wall to all applicable surfaces and ensure proper adhesion of the transition membranes to the substrate, capable of having spray polyurethane foam insulation.
      f. Install counter-flashings:
         1) Metal: Mechanically fasten metal counter-flashings with screws at 8” (200 mm) o.c.
         2) Membrane: Cut into and uncover only 3” of siliconized release paper along one edge of the counter-flashing membrane. Adhere membrane flashing to the pre-primed substrate a minimum of 3” and roll firmly in place.
      g. Ensure veneer anchors are in place.

3.04 APPLICATION

A. Spray-application of polyurethane foam shall be installed in accordance with ULC S705.2-02 and the manufacturer's instructions.

B. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer and the ULC S705.2 Installation standard.

C. Apply in consecutive passes as recommended by manufacturer to thickness as indicated on drawings. Passes shall be not less than ½ inch and not greater than 2 inches.

D. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.

E. Finished surface of foam insulation to be free of voids and embedded foreign objects.

F. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.

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

H. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.

I. Do not permit adjacent work to be damaged by work of this section. Damage to work of this section caused by other sections shall be repaired by this section at the expense of the subcontractor causing the damage.

J. Complete connections to other components or repair any gaps, holes or other damage using material which conforms to ULC S710.1 Polyurethane Sealant Foam - One Component - Material or ULC S711.1 Polyurethane Sealant Foam - Two Components - Material and shall be installed in accordance with ULC S710.2 Polyurethane Sealant Foam - One component - Installation or ULC S711.2 Polyurethane Sealant Foam - Two Component - Installation, whichever is appropriate.

K. Where insulation is not protected with masonry veneer, install intumescent paint to required wet or dry mil thickness or coverage rate in accordance with manufacturer's instructions, by brush, roller, conventional or airless spray.

3.05 TOLERANCES

A. Maximum variation from indicated thickness: minus (-) ¼ inch; plus (+) ½ inch.

3.06 PROTECTION

A. Cover the spray polyurethane foam with a thermal barrier when installed on the interior of the building.

END OF SECTION

SECTION 07 31 13
ASPHALT SHINGLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:
   1. Asphalt shingles.
   2. Felt underlayment.
   3. Self-adhering sheet underlayment.
   4. Ridge vents

1.02 RELATED SECTIONS

A. Division 6 Section "Rough Carpentry" for roof deck wood structural panels.

B. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings and counterflashings not part of this Section.

1.03 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.04 SUBMITTALS

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

B. Samples for Initial Selection: For each type of asphalt shingle, ridge and hip cap shingles indicated.
   1. Include similar Samples of trim and accessories involving color selection.

C. Samples for Verification:
   1. Ridge cap, drip edge and other accessories

D. Qualification Data: For Installer.

E. Warranties: Special warranties specified in this Section.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain field, ridge and hip cap shingles through one source from a single asphalt shingle manufacturer.

B. Fire-Test-Response Characteristics: Provide asphalt shingle and related roofing materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method below 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. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
   1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
   2. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt shingle roofing to be performed according to manufacturer's written instructions and warranty requirements.
   1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period. Materials failures include manufacturing defects and failure of asphalt shingles to self-seal after a reasonable time.
   1. Material Warranty Period: 50 years from date of Substantial Completion, prorated, with first 5 years nonprorated.
   2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 110mph for 5 years from date of Substantial Completion.
   3. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor five years from date of Substantial Completion.
   4. Workmanship Warranty Period: 10 years from date of Substantial Completion.
   5. Special Project Warranty: Roofing Installer's warranty, on warranty form at end of this Section, signed by roofing Installer, covering Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within the following warranty period:
      a. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. GAF Materials Corporation

B. Celotex Corporation.

C. CertainTeed Corporation.

D. Owens Corning.

2.02 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Laminated-Strip Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
   1. Basis-of-Design Product:
      a. GAF Materials Corporation, Elk; “Camelot”, or a comparable product of one of the following:
         1) Celotex Corporation.
         2) CertainTeed Corporation.
         3) Owens Corning.
   2. Strip Size: Manufacturer's standard.
   3. Algae Resistance: Granules treated to resist algae discoloration.
   4. Color and Blends: As selected by Architect from manufacturer's full range.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering Eave Protection and Underlayment Membrane:

1. ASTM D 1970, minimum of 40-mil- thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.
2. Available Products, as approved by the single manufacturer:
   a. Carlisle Coatings & Waterproofing, Div. of Carlisle Companies Inc.; Dri-Start A
   b. Grace, W. R. & Co.; Grace Ice and Water Shield.
   c. Henry Company; Perma-Seal PE.
   d. Johns Manville International, Inc.; Roof Defender.
   e. NEI Advanced Composite Technology; AC Poly Ice and StormSeal.
   f. Owens Corning; WeatherLock M.
   g. Polyguard Products, Inc.; Polyguard Deck Guard.
   h. Protecto Wrap Company; Rainproof TM.
   i. SafSeal Innovations; SafSeal 7740.

B. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
1. Self Sealability: Passing nail sealability test specified in ASTM D1970.
2. Low Temperature Flexibility: Passing test specified in ASTM D1970.
3. Fasteners: As specified by manufacturer and building code qualification report or approval, if any.
4. Products:
   a. Deck-Armor Premium Breathable Roof Deck Protection by GAF.
   b. Substitutions: See Division 1 - Product Requirements.

2.04 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized steel wire shingle nails, minimum 0.120-inch- diameter, smooth shank, sharp-pointed, with a minimum 3/8-inch- diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
2. Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized steel wire with low profile capped heads or disc caps, 1-inch minimum diameter.

2.05 METAL FLASHING AND TRIM

A. Sheet Metal Flashing and Trim: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
1. Sheet Metal: Coil-coated aluminum.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item.
1. Apron Flashings: Fabricate with lower flange a minimum of 5 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 5 inches over the underlying asphalt shingle and up the vertical surface.
3. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge. Provide vented edge drip at vented insulation.

2.06 RIDGE VENTS:

A. Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with nonwoven geotextile filter strips and external deflector baffles for use under ridge shingles. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ridge Filtervent; Air Vent, Inc. (for Class A).
   2. Cobra Ridge Vent; GAF Building Materials Corporation.
   3. Roll Vent; Obdyke: Benjamin Obdyke, Inc.
   4. Trimline; Trimline Roof Ventilation Systems.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
   3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

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

3.02 UNDERLAYMENT INSTALLATION

A. Single-Layer Underlayment: Install single layer of underlayment on roof deck perpendicular to roof slope in parallel courses. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with underlayment nails.
   1. Install underlayment on roof deck not covered by self-adhering sheet underlayment.
      a. Lap sides over self-adhering sheet underlayment not less than 3 inches in direction to shed water. Lap ends not less than 6 inches over self-adhering sheet underlayment.

B. Self-Adhering Sheet (Ice and Water Shield) Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below, unless indicated otherwise on drawings, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
   1. Eaves: Extend from edges of eaves 24 inches beyond interior face of exterior wall.
   2. Valleys: Extend from lowest to highest point 18 inches on each side.
   3. Hips: Extend 18 inches on each side.
   4. Sidewalls: Extend beyond sidewall 18 inches and return vertically against sidewall not less than 4 inches.

3.03 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
   1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

C. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

3.04 ASPHALT SHINGLE INSTALLATION

A. Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed at least 7 inches wide with self-sealing strip face up at roof edge.
   1. Extend asphalt shingles 1/2 inch over fascia at eaves and rakes.
   2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure, unless otherwise indicated by manufacturer.

D. Fasten asphalt shingle strips with a minimum of six roofing nails located according to manufacturer's written instructions.
   1. Where roof slope exceeds 20:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
   2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
   3. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

E. Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 12 inches beyond center of valley. Use one-piece shingle strips without joints in the valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2 inches short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
   1. Do not nail asphalt shingles within 6 inches of valley center.
   2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- wide bed of asphalt roofing cement.
   3. "California Closed-Cut Valleys" are not permitted.

F. Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Fasten with roofing nails of sufficient length to penetrate sheathing.

3.05 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 sheet metal roofing assembly including trim, copings, seam covers, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items.
   2. Install accessories integral to sheet metal roofing that are specified in Division 7 Section "Sheet Metal Flashing and Trim" to comply with that Section's requirements.

END OF SECTION

SECTION 07 41 13
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural roofing system of preformed steel panels.

B. Attachment system.

C. Finishes.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Roof sheathing.

B. Section 07 42 13 - Metal Wall Panels: Preformed wall panels.

C. Section 07 92 00 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

1.04 SUBMITTALS

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

B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.

C. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches (305 mm) square, representing actual roofing metal, thickness, profile, color, and texture.

E. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of twenty years from Date of Substantial Completion.

C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ARCHITECTURAL METAL ROOF PANELS

A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.
   1. Steel Panels:
      a. Aluminum-zinc alloy-coated steel complying with ASTM A792/A792M; minimum AZ50 (AZM150) coating.
      b. Steel Thickness: Minimum 24 gage (0.024 inch) (0.61 mm).
   2. Profile: Standing seam, with minimum 3 inch (__ mm) seam height; concealed fastener system for field seaming with special tool.
   3. Texture: Smooth.
   4. Width: Maximum panel coverage of 18 inches (457 mm).
   5. Manufacturer: Centria: SRS3 Structural Design Panels.
      a. Other Approved Manufacturers / Products: Firestone Building Products
      b. Other Approved Manufacturers / Products: PAC-Clad
   6. Locations: Accent roof areas as shown.

2.02 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.03 SECONDARY FRAMING

2.04 FABRICATION

A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

2.05 FINISHES

A. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil (0.023 mm); color and gloss to match sample.

2.06 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, and caps of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

D. Self-Adhering Eave Protection Membrane:
   1. ASTM D 1970, minimum of 40-mil- thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.
   2. Manufacturer and Products:
      a. Carlisle Coatings & Waterproofing, Div. of Carlisle Companies Inc.; Dri-Start A
      b. Grace, W. R. & Co.; Grace Ice and Water Shield.
      c. Henry Company; Perma-Seal PE.
      d. Owens Corning; WeatherLock M.
      e. Substitutions: See Section 01 6000 - Product Requirements.

E. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
   1. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
   2. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
   3. Fasteners: As specified by manufacturer and building code qualification report or approval.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

B. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

C. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 UNDERLAYMENT INSTALLATION

A. Underlayment: Install single layer of underlayment on roof deck perpendicular to roof slope in parallel courses. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with underlayment nails.
   1. Install underlayment on roof deck not covered by self-adhering sheet underlayment.
      a. Lap sides over self-adhering sheet underlayment not less than 3 inches in direction to shed water. Lap ends not less than 6 inches over self-adhering sheet underlayment.

B. Self-Adhering Sheet (Ice and Water Shield) Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below, unless indicated otherwise on drawings, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
   1. Eaves: Extend from edges of eaves 24 inches beyond interior face of exterior wall.
   2. Valleys: Extend from lowest to highest point 18 inches on each side.

3.04 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, trim, moldings, closure strips, caps, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
   2. Incorporate concealed clips at panel joints, and snap panels together to provide weathertight joints.
   3. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

3.05 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.06 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 42 13
METAL WALL PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concealed and exposed fastener metal wall panels as part of the assembly described below.
   1. Metal Wall Panels over Masonry Wall System: Single-skin exposed fastener metal wall panels applied as exterior cladding over a masonry wall and spray-applied insulation. Metal wall panel installation specified in this Section includes secondary metal subgirt framing for panel attachment.
   2. Single-skin concealed fastener metal wall panels applied as exterior cladding over a framed wall and spray-applied insulation.

1.02 RELATED REQUIREMENTS

A. Division 04 Section "Unit Masonry"

B. Division 07 Section "Air Barriers": applied air, moisture, and water vapor control membrane.

C. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.

D. Division 07 Section "Joint Sealants" for field-applied joint sealants.

1.03 REFERENCES

A. American Architectural Manufacturer's Association (AAMA):
   1. AAMA 621 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.

B. ASTM International (ASTM):
   1. ASTM A 653/A 653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.
   3. ASTM C 920 - Specification for Elastomeric Joint Sealants.
   4. ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
   5. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

C. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):
   1. Architectural Sheet Metal Manual.

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

B. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, per ASTM E 72:
   1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.

2. Limits of Deflection: Metal wall panel assembly shall withstand scheduled wind pressure with the following allowable deflection:
   a. Maximum allowable deflection limited to L/180 deflection of panel perimeter normal to plane of wall with no evidence of failure.
3. Secondary Metal Framing: Design secondary metal framing for metal wall panel assembly according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
4. Side Joint Disengagement: Panels must be designed and tested under Negative load per ASTM E 72.

C. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

1.05 QUALITY ASSURANCE

A. Manufacturer/Source: Provide metal wall panel and panel accessories from a single manufacturer.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years experience in manufacture of similar products in successful use in similar applications.
   1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
      a. Product data, including certified independent test data indicating compliance with requirements.
      b. Sample submittal from similar project.
      c. Project references: Minimum of 5 installations not less than 5 years old, with Owner and Architect contact information.
      d. Sample warranty.
   2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
   3. Approved manufacturers must meet separate requirements of Submittals Article.

C. Installer Qualifications: Experienced Installer with minimum of 5 years experience with successfully completed projects of a similar nature and scope.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Construction Manager, Owner, Architect, manufacturer's representative, and other trade contractors.
   1. Coordinate building framing in relation to metal wall panel assembly.
   2. Coordinate installation of building air and water barrier behind metal wall panel assembly.
   3. Coordinate window, door and louver, and other openings and penetrations of metal wall panel assembly.

1.07 ACTION SUBMITTALS

A. Product Data: Manufacturer’s data sheets, for specified products.
   1. Include data indicating compliance with performance requirements, including load span tables tested for side joint disengagement under negative loads per ASTM E 72.

B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized Installer. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment. Provide details at a minimum scale 1-1/2-inch per foot of all required trim and extrusions needed for a complete installation.

1. Indicate points of supporting structure that must coordinate with metal wall panel assembly installation.

C. Samples for Initial Selection: For each product specified, provide representative color charts of manufacturer's full range of colors.

D. Samples for Verification: Provide 12-inch (300 mm) section of panel(s) showing finishes. Provide 12-inch (300 mm) long pieces of trim pieces and other exposed components.

1.08 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.

B. Qualification Information: For Installer firm.

C. Manufacturer's warranty: Submit sample warranty.

1.09 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect metal wall panel products during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.

1. Deliver, unload, store, and erect metal wall panel products and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.

1.11 WARRANTY

A. Special Manufacturer’s Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials and workmanship within two years from date of Substantial Completion.

B. Special Panel Finish Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace metal wall panels that evidence deterioration of finish within the following periods from the date of substantial completion:

1. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:

1. CENTRIA Architectural Systems; Moon Township, PA 15108-2944. Tel: (800)759-7474. Tel: (412)299-8000. Fax: (412)299-8317. Email: info@CENTRIA.com. Web: www.CENTRIA.com.

a. Type 1: Intercept Series

1) Location: As Indicated on Drawings

b. Type 2: Exposed Fastener Profiles Econolap 3/4"

1) Location: Vertical walls at mansard roofs.

B. Other Manufacturers: Products meeting the performance and appearance must be submitted for approval prior to bidding. The following may be considered pending color and sample pre-approval, including accessories.

1. ATAS International, Inc.:6612 Snowdrift Road, Allentown, PA 18106. www.atas.com.

2. MBCI.

2.02 METAL WALL PANEL MATERIALS

A. Metallic-Coated Steel Face Sheet: Coil-coated, ASTM A 755/A 755M.
   1. Aluminum-zinc alloy-coated Steel Sheet: ASTM A 792/A 792 M, Class AZ50 Grade 50 (Class AZM150, Grade 275), structural steel quality.
   2. Face Sheet: Minimum 0.030 inch/22 gage (0.76 mm) nominal uncoated thickness.
   3. Surface: Smooth.

B. Perforated Screen Wall: Aluminum Face Sheet: Smooth surface coil-coated, ASTM B209, 3003-H14 alloy, 0.040 inch (1.0 mm) nominal thickness.

2.03 CONCEALED FASTENER METAL WALL PANELS

A. Metal Wall Panels, General: Factory-formed, concealed fastener panels with interconnecting side joints, fastened to supports with concealed fasteners, with factory-applied sealant in side laps when required to meet performance requirements.

B. Horizontal Joints: Horizontal Joints with drip edge and sloped drain shelf to provide positive water shed away from Panel Joinery.

C. Type 1: Closed-joint back-ventilated Rainscreen Panel with ¾"(19mm) wide reveals betweeen panels with independent panel attachment.
   1. Basis of Design Product: CENTRIA, Intercept Entyre Panel System
   2. Installation Sequence:
      a. Bottom up
   3. Installation Patterns:
      a. Vertical and/or horizontal orientation
      b. Variable running bond—vertically and horizontally
   4. Panel Reveal Width:
      a. 3/4" [19mm] Standard
   5. Panel Depth:
      a. 1 3/8" [35 mm] Standard
   6. Panel Coverage: As Indicted on Drawings

2.04 EXPOSED FASTENER METAL WALL PANELS

A. Type 2: Corrugated profile with lap joint:
   1. Basis of Design Product: CENTRIA, Exposed Fastener Profiles Econolap 3/4"
   2. Panel Coverage: 34 2/3 inches.
   3. Panel Height: 3/4 inches.
   4. Rib Spacing: 2 2/3 inches.

2.05 METAL WALL PANEL ACCESSORIES

A. Metal Wall Panel Accessories, General: Provide complete metal wall panel assembly incorporating trim, copings, fasciae, parapet caps, soffits, sills, inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed shims, flashings, gaskets, lap strips, closure strips, and caps for a complete installation. Fabricate accessories in accordance with SMACNA Manual.

B. Mitered Corners: Structurally-bonded horizontal interior and exterior trimless corners matching metal wall panel material, profile, and factory-applied finish, fabricated and finished by metal wall panel manufacturer.
   1. Welded, riveted, fastened, or field- fabricated corners do not meet the requirements of this specification.
   2. Basis of Design: CENTRIA, MicroSeam Corners.

C. Formed Flashing and Trim: Match material, thickness, and color of metal wall panels.

D. Sealants: Type recommended by metal wall panel manufacturer for application, meeting requirements of Division 07 Section "Joint Sealants."

E. Flashing Tape: 4-inch wide self-adhering butyl flashing tape.

F. Fasteners: Self-tapping screws and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal wall panels by means factory-applied coating.

2.06 SECONDARY METAL SUBGIRT FRAMING

A. Miscellaneous Framing Components, General: Cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z180).
   1. Hat Channels: 0.053 inch/16 ga. (1.34 mm) minimum.
   2. Sill Channels: 0.053 inch/16 ga. (1.34 mm) minimum.

2.07 METAL WALL PANEL FINISHES

A. Exposed Coil-Coated Finish System:
   1. Fluoropolymer Two-Coat System: 0.2-mil primer with 0.8-mil 70 percent PVDF fluoropolymer color coat, AAMA 621.
      a. Basis of Design: CENTRIA Fluorofinish.

B. Color:
   1. Exterior Surface: As selected by Architect from manufacturer's standard colors.
   2. Interior Surface: Manufacturer's standard primer color.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine metal wall panel substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.

B. Wall Substrate: Confirm that wall substrate is within tolerances acceptable to metal wall panel system manufacturer.
   1. Maximum substrate and framing deviations from flat plane acceptable:
      a. 1/4-inch in 20 feet vertically or horizontally.
      b. 1/2-inch across building elevation.
      c. 1/8-inch in 5 feet.

C. Openings: Verify that window, door, louver and other penetrations match layout on shop drawings.

D. Air/Moisture Barriers: Confirm that work has been completed, inspected, and tested as required.

E. Correct out-of-tolerance work and other deficient conditions prior to proceeding with metal wall panel system installation.

3.02 SECONDARY FRAMING INSTALLATION

A. Secondary Metal Subgirt Framing: Install secondary metal framing components to tolerances indicated, as shown on approved shop drawings. Install secondary metal framing and other metal panel supports per ASTM C 1007 and metal wall panel manufacturer's recommendations.

3.03 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in accordance with approved shop drawings and manufacturer's recommendations. Install metal wall panels in orientation (horizontal), sizes (24"x 48" nominal), and locations indicated. Anchor metal wall panels and other components securely in place. Provide for thermal and structural movement: Install in an ashlar pattern.

B. Attach panels to metal framing using recommended clips, screws, fasteners, sealants, and adhesives indicated on approved shop drawings.
   1. Fasteners for Steel Wall Panels: Stainless-steel for exterior locations and locations exposed to moisture; carbon steel for interior use only.
   2. Fasten metal wall panels to supports with fasteners and spacing recommended by manufacturer.
   3. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
   4. Dissimilar Materials: Where elements of metal wall panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

C. Joint Sealers: Install joint sealants where indicated on approved shop drawings.

3.04 ACCESSORY INSTALLATION

A. General: Install metal wall panel accessories with positive anchorage to building and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install related flashings and sheet metal trim per requirements of Division 07 Section "Sheet Metal Flashing and Trim."
   2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, lap strips, flashings, sealants, fillers, closure strips, and similar items.
   3. Comply with performance requirements and manufacturer's written installation instructions.
   4. Provide concealed fasteners except where noted on approved shop drawings.
   5. Set units true to line and level as indicated.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a service representative authorized by metal wall panel manufacturer to inspect completed installation. Submit written report.

B. Correct deficiencies noted in manufacturer's report.

3.06 CLEANING AND PROTECTION

A. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.

B. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

END OF SECTION

SECTION 07 53 00
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Elastomeric roofing membrane, mechanically fastened conventional and adhered conventional application.

B. Insulation, flat and tapered.

C. Flashings.

D. Roofing stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

A. Section 05 31 00 - Steel Decking: Product requirements for acoustical insulation for deck flutes, for placement by this section.

B. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.

C. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings, reglets.

D. Section 07 71 00 - Roof Specialties: Copings, fascia, prefabricated roofing expansion joint flashing; to be included in roofing system warranty.

E. Section 07 72 00 - Roof Accessories: Roof-mounted units; prefabricated curbs.

F. Section 26 41 13 - Lightning Protection for Structures.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2015.

B. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2012.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2017.

D. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.

E. FM DS 1-28 - Wind Design; 2007.

F. NRCA (RM) - The NRCA Roofing Manual; 2017.

G. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, and fasteners.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and mechanical fastener layout.

D. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

E. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, and supplementary instructions given.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience, and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

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

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F (5 degrees C) or above 90 degrees F (____ degrees C).

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, roof insulation, and walkway products, for the following warranty period:

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

C. Manufacturer's Warranty: Manufacturer's Warranty 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: 25 years from date of Substantial Completion.
2. Coverage: Material and labor.
3. Include edge metal in Roofing System Warranty. See Section 077100.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. EPDM Membrane Materials:
   1. Carlisle Roofing Systems, Inc: www.carlisle-syntec.com.
   2. Firestone Building Products, LLC: www.firestonebpco.com.
   3. Versico, a division of Carlisle Construction Materials Inc: www.versico.com/sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROOFING

A. Elastomeric Membrane Roofing: One ply membrane, spot adhered, over insulation.

B. Roofing Assembly Requirements:
   1. Roof Covering External Fire Resistance Classification: UL (DIR) certified Class A.
   2. Factory Mutual Classification: Class 1 and windstorm resistance of 1-60, in accordance with FM DS 1-28.

C. Acceptable Insulation Types - Tapered Application:
   1. Uniform thickness polyisocyanurate board covered with tapered polyisocyanurate board.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); non-reinforced; complying with minimum properties of ASTM D4637/D4637M.
   1. Thickness: 0.060 inch (60 mil) (1.5 mm).
   2. Sheet Width: 120 inch (____ mm), minimum; factory-fabricate into largest sheets possible.
   3. Solar Reflectance: 0.75, minimum, initial, and 0.64, minimum, 3-year, certified by Cool Roof Rating Council.
   4. Thermal Emittance: 0.84, minimum, initial, and 0.87, minimum, 3-year, certified by Cool Roof Rating Council.
   5. Color: White.

B. Seaming Materials: Standard synthetic-rubber polymer primer and 6-inch wide minimum, butyl splice tape with release film.

C. Membrane Fasteners: As recommended by and approved by membrane manufacturer.

D. Flexible Flashing Material: Same material as membrane; complying with the following:
   1. Thickness: 60 mil (____ mm).
   2. Tensile Strength: 1,200 psi (8.3 MPa).
   3. Elasticity: 50 percent with full recovery without set.
   4. Color: White.

2.04 COVER BOARD

A. Fiberglass Mat Faced Gypsum Roof Board:
   1. Thickness: 5/8 inch.
   2. Width: 4 feet.
   3. Length: 8 feet.
   4. Weight: 2.5 lb/sq. ft.
   5. Surfacing: Fiberglass mat with non-asphaltic coating.
   6. Flexural Strength, Parallel (ASTM C473): 100 lbf, minimum.
   7. Flute Span (ASTM E661): 8 inches.
   8. Permeance (ASTM E96): greater than 17 perms.

9. R-Value (ASTM C518): 0.67.
10. Water Absorption (ASTM C1177): Less than 10 percent of weight.
11. Compressive Strength (Applicable Sections of ASTM C472): 900 pounds per square inch.
12. Surface Water Absorption (ASTM C473): Not more than 2 grams.
13. Acceptable Products:
    a. DensDeck Prime, Georgia-Pacific Gypsum.

2.05 INSULATION

A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type II, Class 1, cellulose felt or glass fiber mat both faces; Grade 2 and with the following characteristics:
   1. Compressive Strength: 20 psi (138 kPa)
   2. Board Size: 48 by 96 inch (1220 by 2440 mm).
   3. Board Thickness (base layer): 1.6 inch (41 mm) minimum.
   4. Flat roof insulation thickness: 5" total thickness, two-layers.
   5. Tapered Board insulation: Slope as indicated; minimum thickness 5 inch (____ mm); fabricate of fewest layers possible.
      a. Minimum slope: 1/4 inch per foot.
      b. Sumps at drains: 4'-0" square; 1/2" per foot slope.
   6. Board Edges: Square.

B. Mineral Wool Board Insulation: Rigid, monolithic, dual-density mineral wool, in compliance with ASTM C726.
   1. Board Size: 48 by 48 inches (1220 by 1220 mm).
   2. Board Thickness: 2-1/2 inches (63 mm).
   3. Board Edges: Square.
   4. Thermal Resistance, R-value (RSI-value): 3.8 (0.67) at 75 degrees F (24 degrees C), when tested according to ASTM C518.
   5. Manufacturers:
      a. ROCKWOOL (ROXUL, Inc); TOPROCK DD: www.rockwool.com/#sle.

2.06 ACCESSORIES

A. Prefabricated Roofing Expansion Joint Flashing: Sheet butyl over closed-cell foam backing seamed to stainless steel flanges.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches (150 mm) wide; self adhering.

D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

E. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

F. Membrane Adhesive: As recommended by membrane manufacturer, and:
   1. Provide low-VOC, solvent-based EPDM bonding adhesive that complies with Ozone Transport Commission (OTC) Model Rule, Single Ply Roofing Adhesives; www.otcair.org.

G. Membrane Adhesive Primer: As recommended by membrane manufacturer, and:

1. Provide low-VOC, solvent-based EPDM adhesive primer that complies with Ozone Transport Commission (OTC) Model Rule, Single Ply Roofing Adhesive Primers; www.otcair.org.

H. Insulation Adhesive: As recommended by insulation manufacturer.

I. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Roofing membrane manufacturer's standard.
   2. Size: As indicated.
   3. Surface Color: Black.

J.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 METAL DECK PREPARATION

A. Install preformed acoustical glass fiber insulation strips specified in Section 05 31 00 within roof deck flutes. Install in accordance with manufacturer's instructions.

3.03 INSULATION - UNDER MEMBRANE

A. Attachment of Insulation: Mechanically fasten each layer of insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.

B. Lay subsequent layers of insulation with joints staggered minimum 6 inch (150 mm) from joints of preceding layer.

C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

D. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

F. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

G. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 24 inches (600 mm).
   1. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

H. Do not apply more insulation than can be covered with membrane in same day.

I. Install cover board over insulation with long joints in continuous straight lines with end joints staggered between rows. Adhesive attach cover board, following manufacturer recommendations.

1. For multilayer locations, lay subsequent coverboard layers with joints staggered minimum 6 inch from joints of preceding layer.

3.04 MEMBRANE APPLICATION

A. Apply elastomeric membrane roofing system in accordance with manufacturer's recommendations.

B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

C. Shingle joints on sloped substrate in direction of drainage.

D. Fully Adhered Application: Apply adhesive to substrate and membrane at rate required by manufacturer. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
   1. Protect white surface from discoloration from bonding adhesive.
   2. Do not place bonding adhesive containers or lids on white membrane surface.

E. Spot Adhered Application: Mechanically fasten adhesion discs to substrate. Apply adhesive to discs and bond membrane. Fully adhere one roll before proceeding to adjacent rolls.

F. Overlap edges and ends and seal seams by contact tape, minimum 6 inches (____ mm). Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

G. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 8 inches (____ mm) onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to termination bar.

H. Around roof penetrations, seal flanges and flashings with flexible flashing.

I. Install roofing expansion joints where indicated. Make joints watertight.
   1. Install prefabricated joint components in accordance with manufacturer's instructions.

J. Coordinate installation of roof drains and related flashings.

K. Coordinate installation of associated counterflashings installed under other sections.

3.05 ROOF WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.06 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field quality control and inspection.

B. Require site attendance of roofing and insulation material manufacturers weekly during installation of the Work.

3.07 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Remove markings from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.08 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Installation of flashing materials embedded in masonry.

B. Section 06 10 00 - Rough Carpentry: Wood nailers for sheet metal work.

C. Section 07 25 00 - Weather Barriers: Installation of weather barriers and interface with flashing materials.

D. Section 07 31 13 - Asphalt Shingles: Non-metallic flashings associated with shingle roofing.

E. Section 07 71 00 - Roof Specialties: Manufactured copings, flashings, and expansion joint covers.

F. Section 07 71 23 - Manufactured Gutters and Downspouts.

G. Section 07 72 00 - Roof Accessories: Manufactured metal roof curbs.

H. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

C. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

D. ASTM D2178/D2178M - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 2015a.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 6 by 6 inch (____by____ mm) in size illustrating metal finish color.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gage, (0.0156 inch) (0.40 mm) thick; smooth No. 4 - Brushed finish.

2.02 FLASHING TYPES

A. Flashing Type 1: 2-piece interlocking type:
   1. Material: Stainless steel.
   2. Configurations shall be as shown on drawings.
   3. Where cap flashings or counter flashings occur, they shall be of two-piece construction with a receiver having a special vertical locking slot that requires no malleting or bending to hold the insert member in place.
   4. Keyed or corrugated flashings are unacceptable.
   5. Fasteners, solder for sealing and attachment, etc., shall be as recommended by the manufacturer.
   6. Where flashings do not turn up behind walls, terminate with a 1/4" hook dam.
   7. Thru-wall flashings at parapets shall be hemmed flush with the exposed face of face brick.
   8. Fasteners, mastic for sealing and attachment, etc., shall be as recommended by the manufacturer.

B. Flashing Type 2: Masonry thru-wall type:
   1. Stainless steel core flexible flashing with drainage fabric:
      a. Product standard of quality: York Manufacturing, Inc.; York Flash-Vent SS,
      b. Accepted products:
         1) York Manufacturing, Inc.; York Flash-Vent SS, (www.yorkmfg.com)
         2) STS Coatings, Inc.; Wall Guardian TWF Stainless Steel (www.stscoatings.com)
         3) Building Materials West Company, Inc.; Evacu-Flash SS (www.evacu-flash.com)
   2. Configurations shall be as shown on drawings.
   3. Installation: Refer to Section 04 20 00 - Unit Masonry.

C. Flashing Type 3: Membrane roofing base flashing material as specified in Section 07 53 00 - Elastomeric Membrane Roofing .

D. Flashing Type 4: Formed metal flashing (Other than Type 1):
   1. Material: Stainless steel.
   2. Configurations shall be as shown on drawings.

2.03 ACCESSORIES

A. Fasteners: Stainless steel, with soft neoprene washers.

B. Outside corner and inside corner material; manufacturer’s standard available units using:
   1. Stainless steel: 26 gauge stainless steel.

C. End dam: Product may be folded in line with the flashing material or utilize preformed end dams by manufacturer using:
   1. Stainless steel: 26 gauge stainless steel

D. Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.

E. Sealant to be Concealed in Completed Work: Type 3 as specified in Section 07 92 00.

F. Sealant to be Exposed in Completed Work: Type 1 as specified in Section 07 92 00.

G. Reglets: Surface mounted type, galvanized steel; face and ends covered with plastic tape.

H. Termination Bars: 1 inch wide (25 mm) x 1/8 inch thick (3 mm); stainless steel.

2.04 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 3/4 inch (__ mm) and hemmed to form drip.

G. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing membrane. Return and brake edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

A. Conform to drawing details and to the following:
   1. SMACNA Architectural Sheet Metal Manual,

B. Insert flashings into reglets to form tight fit; secure in place with plastic wedges; seal flashings into reglets with sealant.

C. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Fasten cavity wall flashings to stud back-up with a non-corrosive termination bar and seal the top edge of the flashing with sealant.

G. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 71 23
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 07 3113 - Asphalt Shingles: Sloped roofing system.

B. Section 05 50 00 - Metal Fabrications: Downspout boots.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

D. CDA A4050 - Copper in Architecture - Handbook; current edition.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Comply with applicable code for size and method of rain water discharge.

1.05 SUBMITTALS

A. Product Data: Provide data on prefabricated components.

B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc; Colonial Profile 6 Concealed Drain Gutter: www.saf.com/persys.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.050 inch (____ mm) thick.
   1. Finish: Plain, shop pre-coated with PVDF (polyvinylidene fluoride) coating.
   2. Color: As selected from manufacturer's standard colors.

2.03 COMPONENTS

A. Gutters: Profile as indicated.

B. Downspouts: CDA Rectangular profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Gutter Supports: Brackets.
   2. Downspout Supports: Brackets.

D. Fasteners: Stainless steel, with soft neoprene washers.

2.04 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.05 FINISHES

A. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as scheduled.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Slope gutters 1/16 inch per foot (____ mm/m).

D. Connect downspouts to downspout boots at 24 inches (____ mm) above grade. Seal connection watertight.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Curbs.

B. Equipment rails.

C. Roof penetrations mounting curbs.

D. Roof hatches, manual and automatic operation, including smoke vents.

1.02 RELATED REQUIREMENTS

A. Section 07 53 00 - Elastomeric Membrane Roofing

B. Section 07 71 00 - Roof Specialties: Other manufactured roof items.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

1.04 SUBMITTALS

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

B. Shop Drawings: Submit dimensioned, project specific shop drawings for each type of roof-mounted item.

C. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.06 WARRANTY

A. Correct defective Work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
   2. Sheet Metal Material:

a. Aluminum: 0.080 inch (2.03 mm) minimum thickness, with 3003 alloy, and H14 temper.

3. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 (230); G90 (Z275) coating designation; 18 gage, 0.048 inch (1.21 mm) thick.
4. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
   a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch (152 mm) clearance between curb and metal roof panel flange allowing water to properly flow past curb.
   b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
   c. Maintain at least 12 inch (305 mm) clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
   d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.
5. Provide layouts and configurations indicated on drawings.

B. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
   1. Height Above Finished Roof Surface: 8 inches (203 mm), minimum.
   2. Height Above Roof Deck: 16 inches (406 mm), minimum.

C. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches (400 mm) square unless otherwise indicated.
   1. Provide sliding channel welded along top edge with adjustable height steel bracket, fabricated to fit item supported.
   2. Height Above Finished Roof Surface: 8 inches (203 mm), minimum.
   3. Height Above Roof Deck: 16 inches (406 mm), minimum.

2.02 ROOF HATCHES AND VENTS, MANUAL AND AUTOMATIC OPERATION

A. Roof Hatch Manufacturers:
   1. Bilco Company; Model E-50TB: www.bilco.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Roof Hatches: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
   1. Style: Provide flat metal covers unless otherwise indicated.
   2. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.
   3. Sound Rated Hatches: minimum STC of 46.
   4. Thermally Broken Hatches: Added insulation to frame and cover; available in each manufacturer's standard, single leaf sizes; special sizes available upon request
   5. For Ladder Access: Single leaf; 36 by 36 inches (914 by 914 mm).

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Material: Mill finished aluminum, 11 gage, 0.0907 inch (2.3 mm) thick.
   2. Insulation: Manufacturer's standard; 1 inch (25 mm) rigid glass fiber, located on outside face of curb.

D. Metal Covers: Flush, insulated, hollow metal construction.
   1. Capable of supporting 40 psf (1.92 kPa) live load.

2. Material: Mill finished aluminum; outer cover 11 gage, 0.0907 inch (2.3 mm) thick, liner 0.04 inch (1.0 mm) thick.
3. Insulation: Manufacturer's standard 1 inch (25 mm) rigid glass fiber.
4. Gasket: Neoprene, continuous around cover perimeter.

E. Safety Railing System (Roof Hatches): Manufacturer's standard accessory safety rail system mounted directly to curb.
1. Comply with 29 CFR 1910.23, with a safety factor of two.
2. Posts and Rails: Aluminum tube.
3. Gate: Same material as railing; automatic closing with latch.
4. Finish: Manufacturer's standard, factory applied finish.
5. Fasteners: Stainless steel, Type 316.
6. Manufacturers:
a. BILCO Company; Bil-Guard 2.0: www.bilco.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf (475 kPa) load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 81 00
APPLIED FIREPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fireproofing of interior structural steel not exposed to damage or moisture.

B. Fireproofing of structural steel exposed to damage or moisture.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing.

B. Section 07 81 23 - Intumescent Fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

B. ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2011).

C. ASTM E736 - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2000 (Reapproved 2011).

D. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2015)e1.

E. ASTM E859 - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2011).

F. ASTM E937 - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2011).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. Product Data: Provide data indicating product characteristics.

B. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
   1. Bond strength.
   2. Bond impact.
   3. Compressive strength.
   4. Fire tests using substrate materials similar those on project.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Manufacturer's Certificate: Certify that sprayed-on fireproofing products meet or exceed requirements of contract documents.

E. Manufacturer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience
   1. Approved by manufacturer.

1.07 FIELD CONDITIONS

A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F (4 degrees C) or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

1.08 WARRANTY

A. Correct defective Work within a two year period after Date of Substantial Completion.
   1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
   2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Applied Fireproofing:
   1. Carboline Company: www.carboline.com.
   2. GCP Applied Technologies: www.gcpat.com/fireproofing/#sle.
   3. Isolatek International Corp: www.isolatek.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIREPROOFING ASSEMBLIES

A. Provide assemblies as indicated on drawings.

B. Provide UL fire-rated assemblies to hourly ratings as follows:
   1. Interior columns: 1 hour.
   2. Interior beams: 1 hour.
   3. Interior floors: 1 hour.
   4. Interior roof deck: 1 hour.

2.03 MATERIALS

A. Sprayed Fire-Resistive Material for Interior Applications: Manufacturer's standard factory mixed material, which when combined with water is capable of providing the indicated fire resistance, and conforming to the following requirements:
   1. Composition: Portland cement-based; not mineral fiber-based.
   2. Bond Strength: 1,000 psf (47.9 kPa), minimum, when tested in accordance with ASTM E736 when set and dry.
   3. Dry Density: 21 lb/cu ft (340 kg/cu m), minimum, when tested in accordance with ASTM E605.
   4. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760.
   5. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937.

6. Air Erosion Resistance: Weight loss of 0.025 g/sq ft (0.27 g/sq m), maximum, when tested in accordance with ASTM E859 after 24 hours.
7. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
8. Manufacturers:
   a. GCP Applied Technologies; Monokote Z-106/HY: www.gcpat.com/#sle.
   b. Isolatek International Inc; Product Cafco Blaze-Shield HP , or Cafco 400: www.isolatek.com..
   c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Primer Adhesive: Of type recommended by applied fireproofing manufacturer.

B. Metal Lath: Expanded metal lath; minimum 3.4 pounds per square foot (16 kg/sq m), galvanized finish.

C. Water: Clean, potable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

E. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

A. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.

B. Apply primer adhesive in accordance with manufacturer's instructions.

C. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

D. Coordinate with intumescent fireproofing application for complete coverage.
   1. Refer to Section 07 8123.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.

B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.

C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

D. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

END OF SECTION

SECTION 07 81 23
INTUMESCENT FIREPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thin-film intumescent mastic fireproofing for exposed structural steel.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing.

B. Section 05 21 00 - Steel Joist Framing.

C. Section 07 81 00 - Applied Fireproofing: Conventional cementitious fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.

B. SSPC-PA 2 - Procedure For Determining Conformance To Dry Coating Thickness Requirements; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

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

C. Test Reports: Published fire resistive designs for structural elements of the types required for the project, indicating hourly ratings of each assembly.

D. Field Quality Control Submittals: Submit field test report.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Certificates: Certify that intumescent fireproofing provided for this project meets or exceeds specified requirements in all respects.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company that specializes in manufacturing the type of products specified, with minimum of ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original, unopened containers with identification labels and testing agency markings intact and legible.

B. Store products in manufacturer's unopened packaging until ready for installation.
   1. Store at temperatures not less than 50 degrees F (10 degrees C) in dry, protected area.
   2. Protect from freezing, and do not store in direct sunlight.
   3. Dispose of any materials that have come into contact with contaminants of any kind prior to application.

C. Dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Protect areas of application from windblown dust and rain.

B. Maintain ambient field conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under ambient conditions outside manufacturer's absolute limits.
   1. Provide temporary enclosures as required to control ambient conditions.
   2. Do not apply intumescent fireproofing when ambient temperatures are below 50 degrees F (10 degrees C) without specific approval from manufacturer.
   3. Maintain relative humidity between 40 and 60 percent in areas of application.
   4. Maintain ventilation in enclosed spaces during application and for not less than 72 hours afterward.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Intumescent Mastic Fireproofing:
   1. Carboline Company; A/D Firefilm III: www.carboline.com/#sle.
   2. Hilti, Inc; Fire Finish Steel Protection Spray CFP-SP WB: www.us.hilti.com/#sle.
   3. Isolatek International Corp; CAFCO SprayFilm WB 3 (interior): www.isolatek.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SYSTEM REQUIREMENTS

A. Fireproofing: Provide intumescent thin-film fire resistive coating systems tested by an independent testing agency in accordance with ASTM E119 and acceptable to authorities having jurisdiction (AHJ).
   1. Provide assemblies listed by UL or FM and bearing listing agency label or mark.

B. Structural Steel Columns: Fire resistance rating of 1 hour.

C. Structural Steel Beams: Fire resistance rating of 1 hour.

2.03 MATERIALS

A. Fire Resistive Coating System: Thin film intumescent mastic fireproofing system for fire protection of structural steel.

B. Protective and Decorative Top Coating for exposed conditions: As recommended by fireproofing manufacturer for exposure conditions.
   1. Coordinate with paint specified in Section 09 9000 for color and sheen match between steel coated with intumescent coating and adjacent painted surfaces.

C. Sealers and Primer: As required by tested and listed assemblies, and as recommended by fireproofing manufacturer to suit specific substrate conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates to determine if they are in satisfactory condition to receive intumescent fireproofing; verify that substrates are clean and free of oil, grease, incompatible primers, or other foreign substances capable of impairing bond to fireproofing system.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Comply with manufacturer's instructions for particular conditions of installation in each case.

B. Apply manufacturer’s recommended primer to required coating thickness.

C. Apply fireproofing to full thickness over entire area of each substrate to be protected.

D. Apply coats at manufacturer’s recommended rate to achieve dry film thickness (DFT) as required for fire resistance ratings designated for each condition.

E. Apply intumescent fireproofing by spraying to maximum extent possible, and as necessary complete coverage by roller application or other method acceptable to manufacturer.

F. Achieve uniform finished appearance complying with approved mock-up.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.

B. Arrange for testing of installed intumescent mastic fireproofing by an independent testing laboratory using magnetic pull-off dry film thickness gage in accordance with SSPC-PA 2, and ensure it meets requirements of authorities having jurisdiction (AHJ).

1. Submit field test reports promptly to Contractor and Architect.

C. Repair or replace intumescent mastic fireproofing at locations where test results indicate fireproofing does not meet specified requirements.

3.04 CLEANING

A. Immediately after installation of fireproofing in each area, remove overspray and fallout from other surfaces and clean soiled areas.

3.05 PROTECTION

A. Protect installed intumescent mastic fireproofing from damage due to subsequent construction activities, so fireproofing is without damage or deterioration before Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

3.06 SCHEDULE

A. Locations:

1. Tube steel columns and beams in Area 'C'

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 07 81 00 - Applied Fireproofing.

B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a.

C. ASTM E1966 - Standard Test Method for Fire Resistive Joint Systems; 2007 (Reapproved 2011).

D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops; 2014b.

E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a (Reapproved 2015).

F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2015b.

G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

I. ITS (DIR) - Directory of Listed Products; current edition.

J. FM (AG) - FM Approval Guide; current edition.

K. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

L. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

M. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

N. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD) or FM (AG) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by manufacturer.
   2. Verification of minimum three years documented experience installing work of this type.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop.
   2. Hilti, Inc; _____: www.us.hilti.com/#sle.
   3. Nelson FireStop Products: www.nelsonfirestop.com.
   4. Specified Technologies Inc: www.stifirestop.com/#sle.
   5. International Fireproof Technology, Inc. ; www.painttoprotect.com/.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

D. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. General:
   1. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
   2. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

B. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.

1. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

C. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.

D. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

E. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: Where penetration is not contained in a wall cavity, provide systems that have been tested to show T Rating equal to F Rating, where required by code.
   2. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 COORDINATION

A. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

C. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

D. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

3.04 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.05 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.06 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.07 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

DIVISION 07 SECTION 078413
FIRE PROTECTION, HVAC & PLUMBING PENETRATION FIRESTOPPING
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SECTION 07 84 13

FIRE PROTECTION, HVAC & PLUMBING PENETRATION FIRESTOPPING

PART 1. GENERAL

1.1. SUMMARY

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

B. Section includes:

1. Through-penetration firestopping in fire rated construction.

2. Through-penetration smoke-stopping in smoke partitions.

C. Related items:

1. Fire dampers and manufactured devices: Refer to Division 23 Section HVAC Air Distribution.

2. Smoke dampers and combination fire/smoke dampers. Refer to Division 23 Section HVAC Air Distribution.

1.2. REFERENCES

A. Underwriters Laboratories

1. UL Fire Resistance Directory

a. Through-penetration firestop devices (XHCR)
b. Fire resistance rating (BXUV)
c. Through-penetration firestop systems (XHEZ)
d. Fill, void, or cavity material (XHHW)

B. American Society for Testing and Materials Standards:

C. ASTM E 814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.

1.3. DEFINITIONS

A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.

B. Barriers: Time-rated fire walls, smoke barrier walls, time-rated ceiling/floor assemblies and structural floors.

C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.

D. Penetration: Opening or foreign material passing through or into barrier or structural floor

such that full thickness of rated materials is not obtained.

E. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.

F. Sleeve: Metal fabrication or pipe section extended through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.4. SYSTEM DESCRIPTION

A. Design Requirements

1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations.

2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations.

1.5. SUBMITTALS

A. Submit in accordance with Division 01 Section Submittal Procedures, unless otherwise indicated.

B. Product data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication.

2. Manufacturer's installation instructions.

C. Shop drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Details of each proposed assembly identifying intended products and applicable UL system number, or UL classified devices.

2. Manufacturer or manufacturer's representative shall provide qualified engineering judgment and drawings relating to non-standard applications as needed.

D. Quality control submittals:

1. Statement of qualifications.

E. Applicators' qualifications statement:

1. List past projects indicating required experience.

1.6. QUALITY ASSURANCE

A. Installer's qualifications: Fire experienced in installation or application of systems similar in complexity to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer, State or local authority where applicable.

2. At least 2 years experience with systems.

3. Successfully completed at least 5 comparable scale projects using this system.

B. Local and State regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.

C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. Deliver products in original unopened packaging with legible manufacturer's identification.

2. Coordinate delivery with scheduled installation date, allow minimum storage at site.

B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture and freezing when required. Follow manufacturer's instructions.

1.8. PROJECT CONDITIONS

A. Existing condition:

1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

B. Environmental requirements:

1. Furnish adequate ventilation if using solvent.

2. Furnish forced air ventilation during installation if required by manufacturer.

3. Keep flammable materials away from sparks or flame.

4. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.

1.9. WARRANTY

A. Submit copies of written warranty agreeing to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, or general durability or appear to

deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The warranty period shall be two (2) years from date of substantial completion unless otherwise noted.

PART 2. PRODUCTS

2.1. THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

A. Systems of devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.

1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designed to perform this function.

2. Acceptable manufacturers and products.

a. Those listed in the UL Fire Resistance directory for the UL System involved and as further defined in the System and Applications Schedule in Part 3.6 of this section.

3. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer unless otherwise noted.

2.2. SMOKE-STOPPING AT SMOKE PARTITIONS

A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in The Systems and Applications Schedule in Part 3.6 of this section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

2.3. ACCESSORIES

A. Fill, void or cavity materials: As classified under category XHHW in the UL Fire Resistance Directory.

B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory.

PART 3. EXECUTION

3.1. EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

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

2. Do not proceed until unsatisfactory conditions have been corrected.

B. Coordinate an inspection of all Mechanical Firestopping systems with the Fire Marshal prior to installation of ceilings, walls, etc.

3.2. PREPARATION

A. Clean surfaces to be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

3.3. INSTALLATION

A. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's instruction.

B. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

C. Protect materials from damage on surfaces subject to traffic.

D. When large openings are created in walls or floors to permit installation of pipes, ducts, or other items, close unused portions of opening with firestopping materials tested for the application. See UL Fire Resistance Directory or Section 3.6 of this document.

1. Install smoke stopping as specified for firestopping.

3.4. FIELD QUALITY CONTROL

A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

D. ADJUSTING AND CLEANING

E. Clean up spills of liquid components.

F. Neatly cut and trim materials as required.

G. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.5. SYSTEMS AND APPLICATION SCHEDULES*

PENETRATING ITEM	CONCRETE	GYPSUM	WOOD FLOOR/CEILING
Metal Pipe	CAJ1001 CP25S/L, CP25N/S CAJ1006 CS-195+, FS-195+ CAJ1007 FS-195+, 1-inch& 2-inch Wide CAJ1009 2000, 2000+, 2003 CAJ1010 2000, 2000+, 2003 CAJ1012 2000, 2000+, 2003 CAJ1013 2000, 2000+, 2003 CAJ1014 2000, 2000+, 2003 CAJ1015 2000, 2000+, 2003 CAJ1017 FD 150 CAJ1021 FD 150 CAJ1027 MPS-2+ CAJ1044 CP 25WB+ CAJ1052 CP 25S/L, CP 25N/S CAJ1058 2000, 2000+, 2003 CAJ1060 2000, 2000+, 2003 CAJ1063 2000, 2000+, 2003 CAJ1066 CP 25N/S,CP 25S/L, CP 25WB+ CAJ1091 CP 25N/S,CP 25S/L, CP 25WB+ CAJ1092 CP 25WB+ CAJ1112 FS-195+ CAJ1160 CP 25S/L, CP 25N/S CAJ1175 CP 25WB+ CAJ1176 CP 25WB+ CAJ1188 2000+ CBJ1020 CS-195+, FS-195+ CBJ1021 CS-195+, MPS-2+ CBJ1031 2001 CBJ1032 2001 FA1002 CP 25WB+ WJ1010 CP25WB+ WJ1023 2001	WL1001 CP 25 WL1002 FS-195+ WL1003 CP 25WB+,CP 25N/S WL1008 2000+ WL1009 2000+ WL1010 2000+ WL1016 CP 25WB+ WL1017 CP 25WB+,CP 25N/S WL1032 CP 25WB+,CP 25N/S WL1036 FD 150 WL1037 CS-195+,FS-195+ WL1067 CP 25N/S WL1073 CP 25WB+ WL1080 MPS2+ WL1082 2000+	FC1002 CP 25 FC1003 2000,2000+,20003 FC1006 CP 25WB+
Non-Metallic	CAJ2001 FS-195+, 1-inch& 2-inch WIDE, PPD'S CAJ2002 FS-195+ CAJ2003 CS-195+, FS-195+ CAJ2005 FS-195 CAJ2006 FS-195+ CAJ2013 FS-195+ CAJ2019 2000, 2000+, 2003 CAJ2027 FS-195+, CP 25N/S, CP 25S/L, CP 25WB+ CAJ2028 FS-195, MPS-2+ CAJ2029 FS-195+, PPD'S CAJ2030 CS-195+, FS-195+ CAJ2040 FS-195+, CP 25WB+ CAJ2044 FS-195+, CP 25N/S, CP 25S/L CP 25 WB+ CAJ2090 FS-195+ CAJ2177 FS-195+, PPD'S FA2001 FS-195+, PPD'S FS2002 CS-195+, FS-195+, MPS-2+, PPD'S FA2011 FS-195+ WJ2012 FS-195+ 1-inch WIDE	WL2002 FS-195+, PPD'S WL2003 FS-195+ WL2004 FS-195+ WL2005 FS-195+ 4' WIDE WL2006 FS-195+ WL2013 FS-195+ WL2031 CS-195+, FS-195+ WL2032 CS-195+, FS-195+ WL2033 FS-195+ WL2073 FS-195+ 1-inch WIDE	FC2002 FS-195+, PPD'S FC2007 FS-195+, PPD'S FC2008 FS-195+ FC2009 FS-195+, PPD'S FC2024 FS-195 FC2026 FS-195+ FC2028 FS-195, 1' & 2-inch WIDE, PPD'S

PENETRATING ITEM	CONCRETE	GYPSUM	WOOD FLOOR/CEILING
Insulated Metallic Pipe	CAJ5001 CP 25N/S, CP 25S/L, CP 25WB+ CAJ5002 FS-195+ CAJ5003 FS-195+ CAJ5005 MPS-2+ CAJ5009 2000+, 2003 CAJ5017 FS-195+, CP 25 CAJ5022 FS-195+ CAJ5024 FS-195+ CAJ5030 CS-195+, FS-195+ CAJ5041 2000, 2000+, 2003 CAJ5060 CP 25WB+ CAJ5074 2000+ CBJ5002 CP 25 CBJ5003 FS-195+ FA5001 FS-195+, CP 25WB+	WL5001 FS-195+ WL5002 FS-195+ WL5009 FS-195+ WL5010 FS-195+ WL5011 CP 25WB+ WL5032 2000+ WL5038 CP 25WB+ WL5039 CP 25WB+ WL5040 CP 25WB+ WL5045 CP 25WB+ WL5053 2000+	FC5002 FS-195+ FC5008 FS-195+
Miscellaneous Mechanical HVAC Ducts	CAJ7001 CP 25N/S CP 25S/L CAJ7003 CP 25WB+ CAJ7009 DUCT WRAP, BULK PUTTY		FC7001 CP 25S/L, CP 25N/S
Mixed Penetrating Items Combos	CAJ8001 CS-195+ FS-195 CAJ8003 2000, 2000+, 20003 CAJ8004 2000, 2000+, 20003 CAJ8006 2001 CAJ8013 FS-195+, CP 25 CBJ8004 CS-195, FS-195+ CBJ8005 CS-195+, MPS-2+ CBJ8008 2001 FA8001 FS-195+, CP 25WB+	WL8002 CS-195+, FS-195+	

*Underwriter's Laboratories, Inc., Fire Resistance Directory.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

1.02 RELATED REQUIREMENTS

A. Section 07 13 00 - Sheet Waterproofing: Sealing cracks and joints in waterproofing substrate surfaces using materials specified in this section.

B. Section 07 25 00 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.

C. Section 07 84 00 - Firestopping: Firestopping sealants.

D. Section 08 71 00 - Door Hardware: Setting exterior door thresholds in sealant.

E. Section 08 80 00 - Glazing: Glazing sealants and accessories.

F. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

G. Section 09 22 16 - Non-Structural Metal Framing: Sealing between framing and adjacent construction in acoustical and sound-rated walls and ceilings.

H. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2006 (Reapproved 2011).

B. ASTM C834 - Standard Specification for Latex Sealants; 2014.

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).

G. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.

I. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

1.04 SUBMITTALS

A. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.

3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.

B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

D. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

E. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

F. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

G. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

H. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
1. Identification of testing agency.
2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
   a. Test date.
   b. Copy of test method documents.
   c. Age of sealant upon date of testing.
   d. Test results, modeled after the sample form in the test method document.
   e. Indicate use of photographic record of test.

E. Field Quality Control Plan:
1. Visual inspection of entire length of sealant joints.
2. Non-destructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
3. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.

a. For each different sealant and substrate combination, allow for one test every 100 feet (30 meters) in the first 1000 linear feet (305 linear meters), and one test per 1000 linear feet (305 meters) thereafter, or once per floor on each elevation.
b. If any failures occur in the first 1000 linear feet (305 linear meters), continue testing at frequency of one test per 500 linear feet (152 linear meters) at no extra cost to Owner.

4. Field testing agency's qualifications.
5. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

F. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

G. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.

H. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inch (457 mm) long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch (25 mm) by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.

1.06 WARRANTY

A. Correct defective work within a five year period after Date of Substantial Completion.

B. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
a. Wall expansion and control joints.
b. Joints between door, window, and other frames and adjacent construction.

c. Joints between different exposed materials.
d. Openings below ledge angles in masonry.
e. Other joints indicated below.

2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. Joints between plumbing fixtures and adjacent construction.
3. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
4. Do not seal the following types of joints.
   a. Intentional weepholes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, Type 1, unless otherwise indicated.

C. Interior Joints: Use non-sag acrylic latex sealant, Type 2, unless otherwise indicated.
1. Interior Expansion and Control Joints: Polyurethane sealant; Type 1A.
2. Interior Joints at windows, storefront and curtainwall: Polyurethane sealant; Type 1A.
3. Fire-rated Construction: ASTM C 834, UL Listed.
4. In Sound-Rated Assemblies: Acoustical sealant; Type 5.
5. Type 7 - Narrow Control Joints in Interior Concrete Slabs Exposed to View: Self-leveling polyurea sealant.
6. Interior Wet Areas: Type 6 - Mildew-Resistant Silicone Sealant: not expected to withstand continuous water immersion or traffic. Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.02 JOINT SEALANTS - GENERAL

A. Sealant Types Summary:
1. Type 1: Non-Staining Silicone.
2. Type 1A: Polyurethane.
3. Type 2: Acrylic Emulsion Latex
4. Type 3: Non-Curing Butyl Sealant
5. Type 4: Fire resistant foam sealant: Refer to Section 07 8400 - Firestopping.
6. Type 5: Acoustical Sealant
7. Type 6: Mildew-Resistant Silicone Sealant
8. Type 7: Self-Leveling Polurea Sealant

2.03 NONSAG JOINT SEALANTS

A. Type 1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: _____, minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.

3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Color: To be selected by Architect from manufacturer's standard range.
5. Cure Type: Single-component, neutral moisture curing.
6. Service Temperature Range: Minus 65 to 180 degrees F (Minus 54 to 82 degrees C).
7. Manufacturers:
   a. Dow Chemical Company; 795 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   b. Sika Corporation; Sikasil WS-295: www.usa-sika.com/#sle.
   c. Pecora Corporation; 890NST: www.pecora.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Type 1A - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
5. Manufacturers:
   a. Pecora Corporation; DynaTrol 1-XL: www.pecora.com.
   b. Sika Corporation; Sikaflex-15 LM: www.usa-sika.com/#sle.
   c. Tremco Commercial Sealants & Waterproofing; Dymonic 100: www.tremcosealants.com/#sle.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Type 2 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

D. Type 3 - Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.

E. Type 4: Fire resistant foam sealant: Refer to Section 07 8400 - Firestopping.

F. Type 5 - Acoustical Sealant for Concealed Locations: ASTM C 834, UL Listed.
1. Composition: Acrylic latex emulsion sealant.
2. Applications: Use for concealed locations only:
   a. Acoustical application: Sealant bead between top stud runner and structure and between bottom stud track and floor.
3. Products:
   a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant: www.pecora.com.
   b. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com.
   c. USG Company; Sheetrock Brand Acoustical Sealant; www.usg.com.

G. Type 6 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.
2. Manufacturers:
   a. Pecora Corporation: www.pecora.com.
   b. Sika Corporation; Sikasil GP: www.usa-sika.com.

2.04 SELF-LEVELING SEALANTS

A. Type 7 - Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
   1. Durometer Hardness, Type A: 75, minimum, after seven days when tested in accordance with ASTM D2240.
   2. Color: To be selected by Architect from manufacturer's standard colors.
   3. Joint Width, Minimum: 1/8 inch (3 mm).
   4. Joint Width, Maximum: 3/4 inch (19 mm).
   5. Joint Depth: Provide product suitable for joints from 1/8 inch (3 mm) to 1 inch (25.4 mm) in depth excluding space for backer rod.
   6. Manufacturers:
      a. Adhesives Technology Corporation; Crackbond JF-311: www.atcepoxy.com/#sle.
      b. ARDEX Engineered Cements; ARDEX ARDISEAL RAPID PLUS: www.ardexamericas.com/#sle.
      c. Euclid Chemical Company; EUCO QWIKjoint UVR: www.euclidchemical.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least 7 days in advance.
   3. Record each test on Preinstallation Adhesion Test Log as indicated.
   4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet (30 linear m), notify Architect immediately.

C. Destructive Adhesion Testing: If there are any failures in first 1000 linear feet (300 linear m), notify Architect immediately.

D. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

E. Repair destructive test location damage immediately after evaluation and recording of results.

3.05 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint assemblies for masonry wall, interior wall and floor surfaces.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Placement of joint cover assembly frames in masonry.

B. Section 07 71 00 - Roof Specialties: Roof expansion and control joint covers.

C. Section 09 21 16 - Gypsum Board Assemblies: Placement of expansion joint assemblies in gypsum board walls and ceilings.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2010.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction.

D. Samples: Submit two samples 6 inch (____ mm) long, illustrating profile, dimension, color, and finish selected.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Resilient Joint Filler: 20 ft (____ mm) length and any special tools required for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Construction Specialties, Inc; (Basis of Design): www.c-sgroup.com.
   2. MM Systems Corp: www.mmsystemscorp.com.
   3. Emseal: www.emseal.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
   1. Joint Dimensions and Configurations: As indicated on drawings.
   2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.
   1. If floor covering is not indicated, obtain instructions from Architect before proceeding.
   2. If style is not indicated, provide extruded aluminum frame both sides, resilient seals, and minimize exposed metal.

C. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.

D. Covers In Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

E. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.
   1. Acceptable Evaluation Agencies: UL (DIR) and ITS (DIR).

2.03 ARCHITECTURAL JOINT SYSTEMS FOR EXTERIOR WALLS

A. Exterior Expansion Joint Sealer: Factory-applied low-modulous silicone, acrylic-impregnated expanding foam sealant and closed-cell (EVA) foam combined in a unified, binary sealant system.
   1. Size as required to provide weathertight seal when installed.

2.04 MATERIALS

A. Seal Material: Silicone.
   1. Color: As selected by Architect from manufacturer's standard range.

B. All miters and changes in direction to be field fabricated.

C. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
   1. Exposed Finish Outdoors: Superior Performing Organic Coating: multiple coat, thermally cured polyvinylidene fluoride system; Kynar 500 or Hylar 5000..
   2. Exposed Finish at Floors: Mill finish or natural anodized.
   3. Exposed Finish at Walls and Ceilings: Natural anodized.

D. Resilient Seals:
   1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
   2. For Pedestrian Traffic Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.
   3. Color: as selected from manufacturers standard range.

E. Anchors and Fasteners: As recommended by cover manufacturer.

F. Threaded Fasteners: Stainless steel.

G. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.02 PREPARATION

A. Prepare substrates according to architectural joint system manufacturer's written instructions.

B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.

C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.03 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.

D. Locate in continuous contact with adjacent surfaces

E. Rigidly anchor to substrate to prevent misalignment. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

F. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
   1. Provide in continuous lengths for straight sections.
   2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
   3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

G. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer before installing compression seals.

H. Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
   1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.04 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

B. Provide strippable coating to protect finish surface.

3.05 SCHEDULE

A. Floor Expansion Joint Covers:
   1. Construction Specialties, Inc., Model GTR/GTRW
   2. Joint width: 2"

3. Fire barrier: 2 hour rating

B. Wall Joints at Exterior Walls:
1. Emseal, Model WFR2, or Construction Specialties, Inc., Model VF with fire barrier.
2. Joint width: 2"
3. Fire barrier: 2 hour rating

C. Wall Joints at Interior Walls:
1. Construction Specialties, Inc., Model FWF
2. Use complementing joint covers FWFC, FWFM as applicable
3. Joint width: 2"
4. Fire barrier: 2 hour rating

D. Wall Joints at Interior Ceilings:
1. Construction Specialties, Inc., Model FCF
2. Use complementing joint covers FWFC, FCFC, FWF as applicable
3. Joint width: 2"
4. Fire barrier: 2 hour rating

E. Roof Joints at Shingle and Metal Roof Areas:
1. Construction Specialties, Inc., Model RJT, RJTW
2. Provide factory-fabricated transitions including end caps, corners, transitions and miters to ensure weather integrity.
3. Joint width: 2"
4. Fire barrier: 2 hour rating
5. Finish: Kynar 500, as selected from manufacturers standard range.

F. Roof Joints at EPDM Roof areas: See Section 07 71 00 - Roof Specialties.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 083473 - Acoustical Doors and Frames: Metal acoustic doors and frames

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI - American National Standards Institute.

B. HMMA - Hollow Metal Manufacturers Association.

C. NAAMM - National Association of Architectural Metal Manufacturers.

D. NFPA - National Fire Protection Association.

E. SDI - Steel Door Institute.

F. UL - Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

F. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.

G. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.

H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

I. ITS (DIR) - Directory of Listed Products; current edition.

J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

L. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

M. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.

N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

O. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

P. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

Q. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

R. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

C. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

E. Manufacturer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
   1. Provide hollow metal frames from SDI Certified manufacturer.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
   2. De La Fontaine Inc: www.delafontaine.com.
   3. Republic Doors: www.republicdoor.com.
   4. Steelcraft, an Allegion brand: www.allegion.com/sle.
   5. Technical Glass Products: www.tgpamerica.com.

2.02 DESIGN CRITERIA

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M,

cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.

2. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Materials

1. Doors and frames to be constructed from formed sheet steel or structural shapes and bars.
   a. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
   b. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
   c. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
2. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door.
3. Door Edge Profile: Hinged edge square, and lock edge beveled.
4. Typical Door Face Sheets: Flush. Refer to Door Schedule for additional information.
5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   a. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
   b. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets
7. Zinc Coating for Typical Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

2.04 HOLLOW METAL DOORS

A. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.

B. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

C. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware". Wire nut connections are not acceptable.

E. Door Finish: Factory primed and field finished.

F. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
   3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
   4. Top and Bottom Closures: Flush with top of faces and edges.
   5. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.

G. Interior Doors, Non-Fire Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M, at wet locations.
   2. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
   3. Top and Bottom Closures: Flush with top of faces and edges.

H. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").

3. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
4. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   a. Attach fire rating label to each fire rated unit.
5. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
6. Top and Bottom Closures: Flush with top of faces and edges.

2.05 HOLLOW METAL FRAMES

A. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

B. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
   1. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

C. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

D. Frame Finish: Factory primed and field finished.

E. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
   2. Frame Metal Thickness: 14 gage, 0.067 inch (1.7 mm), minimum.
   3. Weatherstripping: Separate, see Section 08 71 00.

F. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.

G. Door Frames, Fire-Rated: Full profile/continuously welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.

H. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
   1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.

I. Mullions for Pairs of Doors: Removable type, with profile similar to jambs.

J. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
   1. Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame.
   2. Fasten members at crossings and to jambs by butt welding.

K. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.

L. Frames in Masonry Walls: Size to suit masonry coursing with head member 2 inch (___ mm) high to fill opening without cutting masonry units.

M. Frames Wider than 48 inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.
   1. Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.

N. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and overhead structure.

O. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

P. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.

Q. Electrical Thru-Wiring: Provide hollow metal frames receiving electrified hardware with loose wiring harness (not attached to open throat components or installed in closed mullion tubes) and standardized Molex™ plug connectors on one end to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electric through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".

R. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
   1. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
   2. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
   3. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
   4. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

S. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

T. Jamb Anchors: Provide number and spacing of anchors as follows:
   1. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      a. Two anchors per jamb up to 60 inches high.
      b. Three anchors per jamb from 60 to 90 inches high.
      c. Four anchors per jamb from 90 to 120 inches high.
      d. Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
   2. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      a. Three anchors per jamb up to 60 inches high.
      b. Four anchors per jamb from 60 to 90 inches high.
      c. Five anchors per jamb from 90 to 96 inches high.
      d. Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      e. Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

U. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

V. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

2.06 FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

2.07 ACCESSORIES

A. Glazing: As specified in Section 08 80 00.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, butted corners; prepared for countersink style tamper proof screws.

C. Grout for Frames: Portland cement grout with maximum 4 inch (102 mm) slump for hand troweling; thinner pumpable grout is prohibited.

D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

B. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

C. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

D. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

E. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Install door hardware as specified in Section 08 71 00.

F. Comply with glazing installation requirements of Section 08 80 00.

G. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
   1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
   3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
   4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

H. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

I. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING AND CLEANING

A. Remove grout and other bonding material from hollow metal work immediately after installation.

B. Adjust for smooth and balanced door movement.

C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

D. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 11 16
ALUMINUM DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

1.02 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.

B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

F. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

H. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

K. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

M. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2010).

N. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

O. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2014a.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each type of door; include information on fabrication methods.

C. Shop Drawings: Include elevations of each opening type.
   1. Verify dimensions by field measurements before fabrication and indicate on shop drawings.

D. Selection Samples: Complete set of color and finish options, using actual materials, for Architect's selection.

E. Verification Samples: Actual pieces of products in each finish specified, not less than 6 inches (150 mm) square or 6 inches (150 mm) long for linear components. For finishes subject to color variation, include not less than two samples illustrating extreme range to be anticipated.

F. Test Report: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

J. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver aluminum components in manufacturer's standard protective packaging, palleted, crated, or banded together.

B. Inspect delivered components for damage and replace. Repaired components will not be accepted.

C. Store components in clean, dry, indoor area, under cover in manufacturer's packaging until installation.

D. Protect materials and finish from damage during handling and installation.

1.06 FIELD CONDITIONS

A. Do not begin installation of interior aluminum components until space has been enclosed and ambient thermal conditions are being maintained at levels consistent with final project requirements.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide ten year manufacturer warranty for defects in workmanship and materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flush Aluminum Doors with Aluminum Face Sheets:
   1. Special-Lite, Inc; _____: www.special-lite.com/#sle.

B. Glazed Aluminum Doors:

1. Wilson Partitions; _____: www.wilsonpart.com/#sle.

C. Aluminum Monumental Stile and Rail Doors:
1. Special-Lite, Inc; _____: www.special-lite.com/#sle.

D. Aluminum Frames:
1. Arcadia, Inc; _____: www.arcadiainc.com/#sle.
2. Wilson Partitions; _____: www.wilsonpart.com/#sle.

2.02 DOORS AND FRAMES

A. Flush Aluminum Doors with Aluminum Face Sheets: Aluminum internal framing and faces; no steel components.
1. Thickness: 1-3/4 inches (44 mm), nominal.
2. Finish: Class I - Natural anodized.
3. Weatherstripping: Replaceable pile type; at jambs and head of exterior doors.

B. Glazed Aluminum Doors: Extruded aluminum tube frame, full glazed, with middle rail; factory glazed.
1. Thickness: 1-3/4 inches (44 mm), nominal.
2. Stile Width: As indicated on drawings.
3. Finish: Class I - Natural anodized.
4. Glazing, Exterior Doors: Sealed insulating units, 1 inch (25.4 mm) thick, made of clear 1/4 inch (6 mm) thick fully tempered glass.

C. Aluminum Monumental Stile and Rail Doors: Extruded aluminum, alloy 6063-T6 temper, with 1/8 inch (3.2 mm) minimum wall thickness, with mid-rail, and having full width galvanized steel 3/8 inch (9.5 mm) tie rods within top and bottom rails.
1. Thickness: 1-3/4 inches (44 mm), nominal.
2. Top Rail Height: 6-1/2 inches (165 mm), nominal.
3. Mid-Rail Height: 6-1/2 inch (165 mm), nominal.
4. Finish: Class I - Natural anodized.

D. Aluminum Frames for Doors, Sidelights, or Transoms: Extruded aluminum, non-thermally broken hollow or C-shaped sections; no steel components.
1. Frame Depth: To fit wall thicknesses as indicated on drawings.
2. Finish: Same as doors.
3. Weatherstripping: Replaceable pile type; at jambs and head.
4. Sidelight/Transom Glazing: Sealed insulating glass units, 1 inch (25 mm) overall thickness, with two panes of clear 1/4 inch (6 mm) thick fully tempered glass.

E. Dimensions and Shapes: As indicated on drawings; dimensions indicated are nominal.
1. Provide vision lites as indicated on drawings.
2. Provide the following clearances:
a. Hinge and Lock Stiles: 1/8 inch (3.2 mm).
b. Between Meeting Stiles: 1/4 inch (6.4 mm).
c. At Top Rail and Bottom Rail: 1/8 inch (3.2 mm).

2.03 COMPONENTS

A. Flush Door Panels: Without visible seams on face sheet.
1. Framing and Hardware Backup: Extruded aluminum tubing, 1/8 inch (3.2 mm) minimum thickness.
2. Perimeter Edges: Extruded aluminum cap.
3. Laminating Adhesive: Manufacturer's standard low-VOC materials.

B. Tubular Doors: Extruded aluminum tubing, 1/8 inch (3.2 mm) minimum thickness, with heavy-duty plated steel through bolts in rails, glazing stops, and glazing gaskets.

C. Frames: Extruded aluminum shapes, not less than 0.062 inch (1.6 mm) thick, reinforced at hinge and strike locations.
   1. Corner Brackets: Extruded aluminum, fastened with stainless steel screws.
   2. Trim: Extruded aluminum, not less than 0.062 inch (1.6 mm) thick, removable snap-in type without exposed fasteners.

D. Vision Lites: Extruded aluminum framed, gasket glazed.

2.04 PERFORMANCE REQUIREMENTS

A. Provide door assemblies that have been designed and fabricated in compliance with specified performance requirements.

B. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency in accordance with ASTM E1996 and Wind Zone 4 - Additional Protection for Large and Small Missile impact and pressure cycling at design wind pressure.

C. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 7.5 psf (359 Pa).

D. Air Leakage: Maximum of 0.1 cu ft/min/sq ft at 6.27 psf (0.5 L/sec/sq m at 300 Pa) differential pressure, when tested in accordance with ASTM E283.

E. Condensation Resistance Factor: 50, measured in accordance with AAMA 1503.

F. Overall U-value, Including Glazing: 0.35, minimum, measured on exterior door size required for this project.

2.05 MATERIALS

A. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy 5005, temper H14, stretcher leveled.

B. Extruded Aluminum: ASTM B221 (ASTM B221M), alloy 6063, temper T5, or alloy 6463, temper T5.

2.06 FINISHES

A. Class I Natural Anodized Finish: Clear anodic coating; AAMA 611 AA-M12C22A41, minimum dry film thickness (DFT) of 0.7 mils, 0.0007 inch (0.018 mm).

B. Class I Color Anodized Finish: Electrolytically deposited colored anodic coating; AAMA 611 AA-M12C22A44, minimum dry film thickness (DFT) of 0.7 mils, 0.0007 inch (0.018 mm).

C. High Performance Organic Coatings: Multiple coats, thermally cured fluoropolymer system with minimum dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm) over aluminum extrusions and panels; AAMA 2604.

D. Color: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces and openings are ready to receive frames and are within tolerances specified in manufacturer's instructions.

3.02 PREPARATION

A. Perform cutting, fitting, forming, drilling, and grinding of frames as required for project conditions.

B. Replace components with damage to exposed finishes.

C. Separate dissimilar metals to prevent electrolytic action between metals.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings.

B. Set frames plumb, square, level, and aligned to receive doors. Anchor frames to adjacent construction in strict accordance with manufacturer's recommendations and within specified tolerances.

C. Where aluminum surfaces contact metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact by painting dissimilar metal with heavy coating of bituminous paint.

D. Hang doors and adjust hardware to achieve specified clearances and proper door operation.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Provide field testing of installed aluminum doors by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.

1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf (91 Pa).
2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.27 psf (300 Pa).

C. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 CLEANING

A. Upon completion of installation, thoroughly clean door and frame surfaces in accordance with AAMA 609 & 610.

B. Do not use abrasive, caustic, or acid cleaning agents.

3.06 PROTECTION

A. Protect products of this section from damage caused by subsequent construction until Date of Substantial Completion.

B. Replace damaged or defective components that cannot be repaired to a condition indistinguishable from undamaged components.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire rated, non-rated, and acoustical as scheduled.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Installing wood doors.

B. Section 08 11 13 - Hollow Metal Doors and Frames.

C. Section 08 71 00 - Door Hardware.

D. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

C. ASTM E413 - Classification for Rating Sound Insulation; 2016.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

G. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

H. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

I. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

J. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

K. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door construction, 12 by 12 inch (____ by ____ mm) in size cut from top corner of door.

E. Samples: Submit two samples of door veneer, 12 by 12 inch (____ by ____ mm) in size illustrating wood grain, stain color, and sheen.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Test Reports: Show compliance with specified requirements for the following:

1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

H. Manufacturer's Installation Instructions: Indicate special installation instructions.

I. Specimen warranty.

J. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 PROJECT CONDITIONS

A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.08 WARRANTY

A. Interior Doors: Provide manufacturer's warranty for the life of the installation.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction, and other possible defects.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:

B. Wood Veneer Faced Doors:

1. Eggers Industries: www.eggersindustries.com.
2. Graham Wood Doors: www.grahamdoors.com.
3. Marshfield DoorSystems, Inc: www.marshfielddoors.com.
4. Algoma Hardware.
5. Oshkosh Architectural Door Company.
6. VT Industries, Inc: www.vtindustries.com.
7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

A. Doors: Refer to drawings for locations and additional requirements.

1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches (44 mm) (44 mm) thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.

2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
3. Sound Retardant Doors: Minimum STC of 45, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
4. Wood veneer facing with factory transparent finish .

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Select white maple, veneer grade in accordance with quality standard indicated, quarter cut, with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Any option allowed by quality standard for grade.
   2. Pairs: Pair match each pair; set match pairs within 10 feet (3 m) (3 m) of each other when doors are closed.

B. Facing Adhesive: Type I - waterproof or Type II - water resistant.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 FACTORY FINISHING - WOOD VENEER DOORS

A. Meet or exceed WDMA I.S. 1-A-04 specifications for a TR-6 catalyzed polyurethane finish system. Factory finish to be water based stain and UV curable polyester urethane finish system that complies with all applicable Federal and State regulations for Volatile Organic Compounds (VOC) and Hazardous Air Pollutants (HAP) emission limitations per the EPA Clean Air Act.

B. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 11, Polyurethane, Catalyzed.
      b. Stain: As selected by Architect.
      c. Sheen: Satin.

C. Factory finish doors in accordance with approved sample.

D. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Glazing: As specified in Section 08 80 00.

B. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style tamper proof screws.

1. At fire-rated doors, veneer wrap fire-rated flush glazing bead with same species as door facing.
2. Where vision lite sizes exceed those tested for manufacturer's tested glazing bead, provide veneer-wrapped metal door lite frame by All Metal Stamping, Inc.: www.allmetalstamping.com, that meets opening requirements.
3. Verify that glazing stops do not interfere with mounting or operation of finish door hardware.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

F. Install door louvers plumb and level.

3.03 TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances.

B. Conform to specified quality standard for telegraphing, warp, and squareness.

C. Maximum Vertical Distortion (Bow): 1/8 inch (3 mm) (3 mm) measured with straight edge or taut string, top to bottom, over an imaginary 36 by 84 inches (915 by 2130 mm) (915 by 2130 mm) surface area.

D. Maximum Width Distortion (Cup): 1/8 inch (3 mm) (3 mm) measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inches (915 by 2130 mm) (915 by 2130 mm) surface area.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling access door and frame units.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Manufacturer's Installation Instructions: Indicate installation requirements.

D. Project Record Documents: Record actual locations of each access unit.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
1. Location: As indicated on drawings.
2. Material: Steel.
3. Size: 24 inch by 24 inch (___ mm by ___ mm).
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
6. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:
1. Location: As indicated on drawings.
2. Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
3. Size: 24 inch by 24 inch (___ mm by ___ mm).
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
6. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

C. Wall-Mounted Units in Exterior Walls:
1. Location: As indicated on drawings.
2. Material: Stainless steel, Type 304, 16 gage.
3. Size: 24 inch by 24 inch (___ mm by ___ mm).

4. Door and Frame: Fully welded and gasketed, with continuous stainless steel piano hinge and no handle.
    a. Gasketing: continuous bilb trim
    b. Lock/latch: stainless steel screws.
5. Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
6. Performance criteria:
    a. Air Infiltration : less than 0.01 cfm/sq foot ASTM E 283
    b. Water Penetration : no leakage at 15.05 psf ASTM E 331
7. Manufacturer/Product:
    a. ADWT2424SS; ACUDOR Products Inc: www.acudor.com
    b. Equivalent products by other approved manufacturers.

2.02 WALL AND CEILING MOUNTED UNITS

A. Manufacturers:
    1. ACUDOR Products Inc: www.acudor.com/#sle.
    2. Babcock-Davis: www.babcockdavis.com/#sle.
    3. Milcor, Inc: www.milcorinc.com.

B. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
    1. Style: Exposed frame with door surface flush with frame surface.
        a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
    2. Door Style: Single thickness with rolled or turned in edges.
    3. Frames: 16 gage, 0.0598 inch (1.52 mm), minimum thickness.
    4. Single Steel Sheet Door Panels: 1/16 inch (1.6 mm), minimum thickness.
    5. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
        a. Provide products listed by UL (FRD) as suitable for purpose indicated.
        b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
    6. Hardware:
        a. Hardware for Fire-Rated Units: As required for listing.
        b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 32 23
SLIDING AND FOLDING GLAZED WALLS AND DOORS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).

C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

D. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

E. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

F. ASTM E413 - Classification for Rating Sound Insulation; 2016.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in installation of products of type specified, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site and store in manufacturer's protective cartons until openings are ready for installation.

1.06 FIELD CONDITIONS

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Panel Frame Sliding/Folding Glazed Doors/Walls:

1. NanaWall Systems, Inc; SL70 Aluminum Framed Folding Panel System: www.nanawall.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Performance Requirements: For units mounted in exterior walls and that require weather performance, provide systems that comply with the following:

1. Structural Performance: Design to withstand design wind loads without damage or permanent set, when tested in accordance with ASTM E330/E330M.
2. Water Penetration Resistance; Static Pressure: No uncontrolled water entry on interior face when tested in accordance with ASTM E331 at differential pressure of 5.25 lbf/sq ft (250 Pa).

B. Acoustical Performance: Provide glass partitions and door assemblies tested by qualified testing agency, calculated in accordance with ASTM E413, tested in accordance with ASTM E90, and rated for not less than Sound Transmission Class (STC) indicated.

2.03 SLIDING/FOLDING GLAZED DOORS/WALLS

A. Aluminum Sliding/Folding Glazed Doors/Walls: Extruded aluminum sliding/folding and operable panel frames, factory fabricated; complete with sill, flashings, support and anchorage devices, and glazing.
1. Configuration: As shown on drawings.
2. Support System: Floor mounted.
3. Seals: Rubber, automatically extending from top and bottom rails.
4. Weather Performance Sill: Recessed raised type, with sealant, shims and fasteners at necessary locations.
a. Finish: To match the panel frame.
5. Panel Rail Depth: 2-3/4 inch (70 mm).
6. Top Rail Height: 4-1/8 inch (105 mm), square edge.
7. Bottom Rail Height: 5-1/16 inch (128 mm), square edge.
8. Panel Weight: 264 lbs (120 kgs), maximum.
9. Aluminum Frames: Factory finished; manufacturer's standard corner construction; thermally broken.
10. Drainage: Provide drainage to exterior for moisture entering joints and glazing spaces and for condensation occurring within frame construction.
11. Glass Stops: Same material and color as frame.
12. Aluminum Frame Finish: PVDF coating in accordance with AAMA 2605.
a. Sheen: Matte.
b. Exterior Color: As selected from manufacturer's full range of colors
c. Interior Color: As selected from manufacturer's full range of colors

2.04 FACTORY ASSEMBLY

A. Factory assemble sliding/folding operable panel frames as single unit, including head, jambs, and bottom sections; provide concealed fasteners.
1. Sizes: Allow for tolerances of rough framed openings, clearances, and shims at perimeter of assemblies.
2. Joints and Corners: Flush, hairline and waterproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
3. Glazing: Factory installed.

2.05 ACCESSORIES

A. Glazing: As specified in Section 08 80 00.

B. Sliding/Folding Hardware: Provide manufacturer's standard hardware including carriages with sealed ball bearing rollers, and top or bottom tracks.

C. Weatherstripping: Brush seals, continuous and replaceable; provide between exterior doors, panels, frame and track.

D. Exposed Hardware Finish: Manufacturer's standard.

E. Hinges: Die-cast zinc.

F. Locking Mechanisms: Minimum two-point deadbolt locking of each panel; manufacturer's standard type.

G. Swing Door Locking: Lever handle lockset with deadbolt into jamb strike; manufacturer's standard type.

H. Anchors: Hot-dipped galvanized or stainless steel in accordance with project and manufacturer's installation requirements.

I. Sealant for Setting Sills and End Dams: Elastomeric sealant acceptable to door manufacturer.

J. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on approved shop drawings.

B. Verify that overhead structural supports are adequate and deflection is in compliance with manufacturer's installation requirements.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit in coordination with air and vapor seal.

3.03 INSTALLATION

A. Install door/wall unit assembly in accordance with manufacturer's instructions.

B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Use anchorage devices to securely fasten assembly to adjacent construction without distortion or imposed stresses.

D. Set exterior sills in full bed of sealant, with end dams and non-blocking sill drainage openings.

E. Install shims at exterior wall sill locations and ensure water dams are not created and sill weep openings are not blocked due to shim placement and orientation.

F. Provide sealed end dams at exterior wall locations.

3.04 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation from Plumb: 1/16 inch (1.5 mm).

C. Maximum Variation from Level: 1/16 inch (1.5 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch (3 mm) from 10 feet (3.05 m) straight edge.

3.05 ADJUSTING

A. Adjust hardware for smooth operation.

3.06 CLEANING

A. Remove protective material from factory finished surfaces.

B. Remove labels and visible markings.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 33 13
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

B. Electric motor operation; wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Rough openings.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 08 71 00 - Door Hardware: Cylinder cores and keys.

D. Section 09 21 16 - Gypsum Board Assemblies: Rough openings.

E. Section 09 91 23 - Interior Painting: Field paint finish.

F. Section 26 05 33.13 - Conduit for Electrical Systems: Conduit from electric circuit to operator and from operator to control station.

G. Section 26 05 83 - Wiring Connections: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. NEMA MG 1 - Motors and Generators; 2014.

E. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two slats, 4 inch long (102 mm long), illustrating shape, color and finish texture.

E. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

F. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

G. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 COILING COUNTER DOORS

A. Coiling Counter Doors, Non-Fire-Rated: Aluminum slat curtain.
   1. Mounting: Between jambs, within prepared opening.
   2. Nominal Slat Size: 1-1/4 inches (32 mm) wide.
   3. Slat Profile: Flat, perforated.
   4. Finish, Aluminum: Anodized.
   5. Color: As selected by Architect from manufacturer's standard range.
   6. Guides: Formed track; same material and finish unless otherwise indicated.
   7. Electric operation.
   8. Locking Devices: Lock and latch handle on outside.

2.02 MATERIALS

A. Curtain Construction: Interlocking, single thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
   3. Aluminum Slats: ASTM B221 (ASTM B221M), aluminum alloy Type 6063; minimum thickness 0.05 inch (1.3 mm).

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
   1. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.

C. Lock Hardware:
   1. For motor operated units, additional lock or latching mechanisms are not required.
   2. Latch Handle: Manufacturer's standard.

D. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

2.03 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction (AHJ) as suitable for purpose specified and indicated.
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure: NEMA MG 1.
   3. Motor Rating: As recommended by manufacturer; continuous duty.
   4. Motor Voltage: 110-120 VAC, single phase, 60 Hz.
   5. Opening Speed: 6 inches per second (150 mm/s).
   6. Manual override in case of power failure.

C. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each electrical operator.
   1. Controls: 24 VAC circuit.
   2. Surface mounted.

D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 26 05 83.

F. Complete wiring from disconnect to unit components.

3.02 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).

C. Maximum Variation From Level: 1/16 inch (1.5 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

3.03 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.04 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling doors , operating hardware, fire-rated, non-fire-rated, and exterior, electric operation.

B. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

A. Section 08 33 26 - Overhead Coiling Grilles.

B. Section 08 71 00 - Door Hardware: Cylinder cores and keys.

C. Section 26 05 83 - Wiring Connections: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

G. NEMA MG 1 - Motors and Generators; 2014.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

I. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

J. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide, , electrical equipment, and component connections and details.

B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

C. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

D. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Fire Doors:

1. Cornell Iron Works, Inc: www.cornelliron.com.

2.02 COILING DOORS

A. Exterior Coiling Doors: Steel slat curtain, insulated.
   1. Capable of withstanding positive and negative wind loads of 20 psf (940 Pa), without undue deflection or damage to components.
   2. Insulated Door Slat Material Requirements:
      a. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.
      b. Minimum Sound Transmission Class (STC) rating of 26 as tested per ASTM E90.
      c. Minimum R-value of 8.0 (U-factor of 0.125) as calculated using the ASHRAE Handbook of Fundamentals.
      d. Insulation to be CFC Free with an Ozone Depletion Potential (ODP) rating of zero.
   3. Nominal Slat Size: 2 inches (50 mm) wide x required length.
   4. Exterior Slat Finish: ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation of a chemical bonding, baked-on polyester base coat and a baked-on polyester finish coat.
   5. Interior slat finish: Coating System and phosphate treatment followed by baked-on polyester powder coat, color as selected by Architect from manufacturer's standard color range, minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
   6. Guide, Angles: Galvanized steel.
   7. Hood Enclosure: Manufacturer's standard; primed steel.
   8. Electric operation.
   9. Mounting: Within framed opening.

B. Non-Fire-Rated Interior Coiling Doors: Steel slat curtain.
   1. Single thickness slats.
   2. Nominal Slat Size: 2 inches (50 mm) wide x required length.
   3. Finish: Factory painted, phosphate treatment followed by baked-on polyester powder coat, minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.color as selected from manufacturer's standard color range.
   4. Hood Enclosure: Manufacturer's standard; primed steel.
   5. Electric operation.
   6. Mounting: Within framed opening.

C. Overhead Acoustic Coiling Doors
   1. Manufacturers:
      a. Manufacturer and Type: Cornel Cookson Thermiser ESD20
      b. Equivalent Products by other manufacturers are also acceptable
   2. Operation: Electric motor
   3. Materials:
      a. Insulated, STC 32 minimum
   4. Finish: Factory powder-coat, selected from manufacturer’s standard colors.
   5. Locations: Scene Shop and Stage

D. Fire-Rated Coiling Doors: Steel slat curtain; conform to NFPA 80.
   1. Provide products listed and labeled by ITS (DIR) or UL (DIR) as suitable for the purpose specified and indicated.
   2. Oversized Openings: Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated units and operating hardware assembly.

3. Nominal Slat Size: 2 inches (50 mm) wide by required length.
4. Finish: Factory painted, color as selected.
5. Hood Enclosure: Manufacturer's standard; primed steel.
6. Fire Alarm Release Mechanism: Electric-motor operated from fire alarm system.
7. Electric operation.
8. Locking Devices: Lock and latch handle on outside.

2.03 MATERIALS AND COMPONENTS

A. Curtain Construction: Interlocking slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
   3. Weatherstripping (exterior doors): Moisture and rot proof, resilient type.
      a. Bottom Bar, Motor Operated Doors: Sensing/weather edge with neoprene astragal extending full width of door bottom bar.
      b. Guides: Replaceable vinyl strip on guides sealing against fascia side of curtain.
      c. Lintel Seal: Nylon brush seal fitted at door header to impede air flow.
      d. Hood: Neoprene/rayon baffle to impede air flow above coil.

B. Steel Slats: Minimum 20 gage (0.8 mm thick)ASTM A 653/A 653M galvanized steel sheet.
   1. Galvanizing: Minimum G90 (Z275) coating.

C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.

D. Guides - Angle: ASTM A36/A36M metal angles, size as indicated.
   1. Hot-dip galvanized in compliance with ASTM A123/A123M.

E. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
   1. Minimum thickness; 24 gage, 24 inch (___ mm).
   2. ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, baked-on base coat and baked-on polyester finish coat.

F. Lock Hardware:
   1. Cylindrical Locking Mechanism: Latchset lock cylinder, specified in Section 08 71 00.
   2. For motor operated units, additional lock or latching mechanisms are not required.
   3. Latch Handle: Manufacturer's standard.

G. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

2.04 ELECTRIC OPERATION

A. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure:
   3. Motor Rating: 1/2 hp (375 W); continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA 250, Type 1.
   7. Opening Speed: 12 inches per second (300 mm/s).

8. Brake: Adjustable friction clutch type, activated by motor controller.
9. Manual override in case of power failure.
10. Refer to Section 26 05 83 for electrical connections.

B. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator conforming to UL 325.
1. 24 volt circuit.
2. Surface mounted, at interior door jamb.
3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms conforming to UL 325.
a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

C. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install fire-rated doors in accordance with NFPA 80.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Coordinate installation of electrical service with Section 26 05 83.

G. Complete wiring from disconnect to unit components.

H. Complete wiring from fire alarm system.

I. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch (1.6 mm).

C. Maximum Variation From Level: 1/16 inch (1.6 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3.2 mm per 3 m) straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 35 13.23
ACCORDION FOLDING FIRE DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal sliding, accordion folding fire rated doors.

B. Associated construction assembly.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Structural steel supports for door.

B. Section 06 10 00 - Rough Carpentry: Wood supports and blocking for track mounting.

C. Section 09 21 16 - Gypsum Board Assemblies: Fire rated gypsum board partition forming opening, track mounting, and storage pocket, if any.

D. Section 09 91 23 - Interior Painting: Finish painting.

E. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Wiring serving motor and control equipment.

F. Section 26 05 33.13 - Conduit for Electrical Systems: Electrical conduit for wiring serving motor and control equipment.

G. Section 28 46 00 - Fire Detection and Alarm: Connections for activating automatic closing operation.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's technical literature; include UL listing data.

C. Shop Drawings: Indicate construction and installation details and dimensions, including layout, electrical requirements, required stacking depth, height of header above finished floor; and requirements for anchorage and support of each door.

D. Selection Samples: Submit color charts for selection of finish color.

E. Operation and Maintenance Data: Operating procedures, troubleshooting and repair methods, wiring diagrams, parts lists, and identification of authorized maintenance firms located in vicinity of project.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's original, unopened packaging, labeled to show name, brand, and type.

B. Store products in a protected dry location, in manufacturer's original packaging, in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Accordion Folding Fire Doors:
   1. Won-Door Corporation; _____: www.wondoor.com/#sle.

2.02 SYSTEM DESCRIPTION

A. Provide motor operated accordion folding fire doors with configurations as indicated on drawings.

B. Fire Door Fire-Rating: 90 minutes.

C. Closing Operation: Automatic motor-operated closing upon activation by low battery charge and fire alarm system. Refer to Section 28 46 00.
   1. Obstruction Detection: Contact with an obstruction causes door to stop and pause before attempting to re-close.
   2. Allow manual closing of door at any time.

D. Opening Operation: Provide exit hardware on both sides of door.
   1. When door has been closed manually, operation of exit hardware to allow door to open 32 inches (0.81 m), minimum.
   2. When door has been closed automatically, operation of exit hardware to allow door to open at least 32 inches (813 mm), width of opening programmable up to full opening, pause for three seconds and then automatically close.

E. Configuration: Bi-parting; straight; recessed in pocket.
   1. Striker Mounting: Recessed.

2.03 COMPONENTS

A. Door Construction: Two parallel, accordion-type walls of panels independently suspended, 6 to 8 inches (152 to 203 mm) apart, without pantographs or interconnections except at lead-post.
   1. Panels: V-grooved steel, 24 gage, 0.0239 inch (0.61 mm); connected by full height steel hinges, 24 gage, 0.0239 inch (0.61 mm) thick.

B. Suspension System: Two tracks, on 8 inch (203 mm) centers, attached to overhead structural support.
   1. Panel Hangers: Each panel individually suspended from steel hanger pin and 1/4 inch (6 mm) diameter ball bearing roller.
   2. Lead Post Hangers: Eight wheel ball bearing trolley.

C. Motor Operator Assembly: Chain drive attached to stabilizer bar trolley with DC gear-motor, drive sprocket and clutch.

D. Power Supply: 12-volt maintenance-free DC battery, automatically maintained at capacity by continuous charger, 120 VAC.

E. Controls: Microprocessor logic board, interconnect board, motor control relays, and limit switches; provide loud audible signal if sensors indicate high or low voltage, AC or DC; drive train, limit switch, or key switch malfunction; or ROM or RAM check-sum error.

2.04 ASSEMBLY

A. Striker Recess: Mount striker in wall recess deep enough to prevent striker from protruding beyond face of wall; construct recess to maintain fire rating of wall.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for installation of door.

B. Verify that electrical utilities have been installed and are accessible.

C. Verify access to, and proper clearance for, motor operators in wall cavity.

D. Verify that door opening is plumb and header is level and of correct dimensions.

E. Notify Architect of any unacceptable conditions or varying dimensions.

F. Commencement of work indicates acceptance of substrate and opening.

3.02 INSTALLATION

A. Install accordion folding fire doors in accordance with manufacturer's written instructions, approved shop drawings, and NFPA 80 standards.

B. Install accordion folding fire doors plumb and level.

C. Install wiring in accordance with applicable codes and NFPA 70.

3.03 ADJUSTING

A. Adjust accordion folding fire door installation to provide uniform clearances and smooth, quiet, non-binding operation.

B. Test accordion folding fire doors closing functions under anticipated conditions.

C. Verify that operations are functional and meet requirements of authorities having jurisdiction.

3.04 CLEANING

A. Clean surfaces using manufacturer's recommended means and methods.

3.05 PROTECTION

A. Protect installed work from damage.

B. Repair or replace defective work prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Infill panels of metal and glass.

C. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

C. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

E. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

H. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 12 by 12 inches (____by____ mm) in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. Correct defective Work within a one year period after Date of Substantial Completion.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

C. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Locations: All storefront locations in exterior building envelope and where 1" insulating glass is scheduled.

B. Manufacturer and Product: Kawneer Trifab 451UT Storefront System: www.kawneer.com.

C. Storefront Framing System:

1. Description: Center set, exterior flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal attached by screw spline joinery.
2. Components: Manufacturer's standard extruded aluminum mullions, 90 degree corner posts, entrance door framing, and indicated shapes.
3. Dual Thermal Barrier: Provide dual continuous thermal barriers by means of poured and debridged pockets consisting of a two-part, chemically curing high density polyurethane which is bonded to the aluminum.
4. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (50 mm wide by 114 mm deep).

D. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another manufacturer with approved submittal meeting the design criteria..
   1. YKK AP America Inc: www.ykkap.com.
   2. Oldcastle Building Envelope: www.obe.com.
   3. EFCO Corporation: www.efcocorp.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 BASIS OF DESIGN -- FRAMING FOR NON-INSULATING GLAZING

A. Locations: Interior locations where single pane glass is scheduled.

B. Manufacturer and Product: Kawneer Trifab 451 Storefront System: www.kawneer.com.

C. Storefront Framing System:
   1. Description: Center set, flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal attached by screw spline joinery.
   2. Components: Manufacturer's standard extruded aluminum mullions, 90 degree corner posts, entrance door framing, glazing adapters, and indicated shapes.
   3. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

D. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another manufacturer with approved submittal meeting the design criteria..
   1. YKK AP America Inc: www.ykkap.com.
   2. Oldcastle Building Envelope: www.obe.com.
   3. EFCO Corporation: www.efcocorp.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Not Thermally-Broken:
   1. Basis of Design: Kawneer 500 Heavy Wall Entrances: www.kawneer.com.
   2. Thickness: 2 inches (51 mm).
   3. Wall thickness: 3/16 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another manufacturer with approved submittal meeting the design criteria..
   1. YKK AP America Inc: www.ykkap.com.
   2. Oldcastle Building Envelope: www.obe.com.
   3. EFCO Corporation: www.efcocorp.com.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Superior performing organic coatings.
      a. Factory finish all surfaces that will be exposed in completed assemblies.

b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

2. Finish Color: As selected by Architect from manufacturer's standard line.
3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

B. Performance Requirements for Thermally-Broken Storefront System:
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
a. Design Wind Loads: Comply with requirements of ASCE 7.
b. See structural drawings for lateral load design factors.
c. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 10 psf (480 Pa). Fastener Heads must be seated and sealed against sill flashing or any fasteners that penetrate through the sill flashing.
3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft (0.3 L/sec sq m) of wall area, when tested in accordance with ASTM E283 at 6.27 psf (300 Pa) pressure differential across assembly.
4. Condensation Resistance Factor of Framing: 66, minimum, measured in accordance with AAMA 1503.
5. Overall U-value Including Low-E Glazing: 0.36 Btu/(hr sq ft deg F) (_____ W/(sq m K)), maximum.

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Framing members for interior applications need not be thermally broken.
2. Glazing Stops: Flush.

B. Glazing: As specified in Section 08 80 00.

C. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
   1. Substrate: high density tempered hardboard and impact resistant layer
   2. Core: Rigid polyisocyanurate insulation.
   3. Interior and Exterior Finish: Superior performance organic coating, custom color to match Architect's sample.
   4. Manufacturers: Mapes Industries, Inc.

D. Aluminum Panning: Extruded aluminum to match Traco wrap around profile "N" at head/jamb. Finish to match storefront. See Section 08 51 13 - Aluminum Windows.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.07 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride (PVDF) system.
   1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil (0.023 mm); color and gloss as selected from manufacturer's standard line.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Extend extruded flashing continuous with splice joints; set in continuous bed of sealant. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Locate expansion mullions where indicated on reviewed shop drawings.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.05 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 44 13
GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass and metal infill panels.

B. Column covers.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 08 80 00 - Glazing.

D. Section 09 21 16 - Gypsum Board Assemblies: Metal stud and gypsum board wall at interior of curtain wall.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 501.4 - Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts; 2009.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

F. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

I. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

K. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 12 by 12 inches (____by____ mm) in size illustrating finished aluminum surface, glazing,infill panels, and glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.

G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Delaware.

B. Full-Size Mock-up Testing: Have a specimen representative of project conditions testedby an independent testing agency for compliance with specified water penetration and water penetration criteria.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

1.07 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-ups.

B. Provide one (1) full-size Window Type CW3 mock-up including all components occurring on project. Assemble to illustrate component assembly including glazing materials, weep drainage system, attachments, anchors, and perimeter sealant.

C. Locate on-site where directed by Architect; mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

A. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

B. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - ALUMINUM CURTAINWALL

A. Locations: All curtainwall locations in exterior building envelope and where 1" insulating glass is scheduled.

B. Manufacturer and Product: Kawneer 1600 Wall System 3 Curtanwall System: www.kawneer.com.

C. Curtainwall System:
   1. Description: Shear block fabrication, with concealed fastener joinery.
   2. Components: Manufacturer's standard extruded aluminum mullions, 90, and 135 degree inside and outside corner posts, entrance door framing, and indicated shapes.
   3. Frame depth: 2-1/2" x 6"
   4. Glazing: inside/outside glazed pressure plate format with 1" (25.4) double glazed insulating glass; captured format.
   5. Horizontals utilize a thermal separator and pressure plate to allow for glazing or re-glazing from the exterior

D. Other Manufacturers: Provide either product identified as "Basis of Design" or an equivalent product of a manufacturer below with approved submittal meeting the design criteria..
   1. YKK AP America Inc: www.ykkap.com.
   2. Oldcastle Building Envelope: www.obe.com..
   3. EFCO Corporation: www.efcocorp.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 CURTAIN WALL

A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Inside/Outside glazed, with pressure plate and mullion cover.
   2. Vertical Mullion Face Width: 2-1/2 inches (63.5 mm).
   3. Vertical Mullion Depth: 6 inches (____ mm).
   4. Finish: Superior performing organic coatings.
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
      c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   5. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

8. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
10. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
1. Design Wind Loads: Comply with the requirements of ASCE 7.
a. Member Deflection: For spans less than 13 feet 6 inches (4115 mm), limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch (19 mm), whichever is less and with full recovery of glazing materials.
b. Member Deflection: For spans over 13 feet 6 inches (4115 mm) and less than 40 feet (12.2 m), limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch (1/240 of span plus 6.4 mm), with full recovery of glazing materials.
2. Seismic Loads: Design and size components to withstand seismic loads and sway displacement in accordance with requirements of ASCE 7.
3. Interstory Differential Lateral Movement: Meeting pass/fail criteria of AAMA 501.4 for Use Group I, Standard Occupancy, when tested at design displacement of 0.010 times greater adjacent story height, maximum, and 1.5 times design displacement, through three complete cycles.
4. Movement: Accommodate the following movement without damage to components or deterioration of seals:
a. Expansion and contraction caused by 180 degrees F (82 degrees C) surface temperature.
b. Expansion and contraction caused by cycling temperature range of 170 degrees F (77 degrees C) over a 12 hour period.
c. Movement of curtain wall relative to perimeter framing.
d. Deflection of structural support framing, under permanent and dynamic loads.

C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
1. Test Pressure Differential: 12 psf (____ Pa).
2. Test Method: ASTM E331.

D. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft (0.3 L/sec sq m) of wall area, when tested in accordance with ASTM E283 at 6.27 psf (300 Pa) pressure differential across assembly.

E. Thermal Performance Requirements:
1. Condensation Resistance Factor of Framing: 70, minimum, measured in accordance with AAMA 1503.
2. Overall U-value Including Glazing: 0.42 Btu/(hr sq ft deg F) (_____ W/(sq m K)), maximum.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Cross-Section: As indicated on drawings.

B. Glazing: As specified in Section 08 80 00.

C. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
   1. Substrate: high density tempered hardboard and impact resistant layer
   2. Core: Rigid polyisocyanurate insulation.
   3. Interior and Exterior Finish: Superior performance organic coating, custom color to match Architect's sample.
   4. Manufacturers: Mapes Industries, Inc.

D. Column Covers: Aluminum, 10 gage, 10 inch (___ mm) minimum thickness, finish to match curtain wall framing members.
   1. Location: Square tube column enclosures at Performing Arts Center and Gymnasium Vestibules.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

D. Firestopping: As specified in Section 07 84 00.

E. Perimeter Sealant: Type 1 specified in Section 07 9200.

F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

G. Glazing Accessories: As specified in Section 08 80 00.

2.05 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
   1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil (0.023 mm); color and gloss as indicated on drawings.

B. Color: To be selected by Architect from manufacturer's full range.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related work.

B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Install firestopping at each floor slab edge.

H. Provide low-expansion foam insulation in shim spaces at perimeter of assembly to maintain continuity of thermal and air barrier.

I. Pressure Plate Framing: Install glazing and infill panels in accordance with Section 08 80 00, using interior or exterior glazing method.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 0.5 inches per 100 ft (12 mm/30 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch (19 mm) and minimum of 1/4 inch (6 mm).

3.04 FIELD QUALITY CONTROL

A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.

B. Test installed curtain wall for water leakage in accordance with ASTM E1105 with a uniform test pressure difference of 8.00 lbf/sq ft (390 Pa).
   1. Field test (1) curtainwall CW3 assembly in place. Location of field test to be provided by Architect.
   2. In window fails, perform additional tests at Contractor's expense.
   3. Upon successful completion of testing, curtain wall may remain in place.

C. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance conforms to specified requirements.

3.05 ADJUSTING

A. Adjust operating sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with fixed sash, operating sash, and infill panels.

B. Factory glazing.

C. Operating hardware.

D. Receptor frame and panning.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between window frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

F. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

G. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. Product Data: Provide component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.

B. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, custom panning profiles, and installation requirements.

C. Samples: Submit two samples, 12 by 12 inch (300 by 300 mm) in size illustrating typical corner construction, accessories, and finishes.

D. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.

3. Evidence of CSA Certification.
4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

E. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

F. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-ups.

B. Provide one (1) full-size Window Type W1 mock-up including all components occurring on project. Assemble to illustrate component assembly including glazing materials, weep drainage system, attachments, anchors, and perimeter sealant.

C. Locate on-site in exterior wall assembly mockup. Mock-up may not remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide 10 year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - AW PERFORMANCE CLASS WINDOWS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 having Performance Class of AW, and Performance Grade at least as high as specified design pressure.

B. Hung Windows, Vertically Sliding; with Matching Fixed Units:
   1. Basis of Design: Kawneer Company Inc.: Series NX-5400 Windows - Single Hung Tilt, 3-1/4" (83 mm) frame depth, CW-PG45-H

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. EFCO, a Pella Company: www.efcocorp.com/#sle.
   2. Peerless Products Inc..
   3. Graham Architectural Products Corp.

D. Substitutions: See Section 01 60 00 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Provide units factory glazed.
   2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   6. Thermal Movement: Design to accommodate thermal movement caused by 180 degrees F (82.2 degrees C) surface temperature without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

B. Performance Requirements: Provide products that comply with the following:
   1. 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/WDMA 101/I.S.2/NAFS.
   2. Where manufacturer's standard window units comply with requirements and have been tested in accordance with specified AAMA/WDMA/CSA 101/I.S.2/A440-05 tests, provide certification by AAMA certified independent laboratory showing compliance with such tests. Submit copy of the test report signed by the independent laboratory.
   3. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:

a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
   1) Refer to structural drawings for lateral load design information.
b. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch (19 mm), whichever is less, at design pressure, but not less than 45 pounds per square foot, based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.
c. Air Infiltration Test: Not exceed 0.30 cubic feet per minute per foot of crack length when tested at a pressure of 6.24 psf. Adjust sash to operate in either direction with a force not exceeding 45 pounds after the sash is in motion. Perform tests in accordance with ASTM E 283 with the sash in a closed and locked position.
d. Water Resistance Test: Subject window unit to a water resistance test in accordance with ASTM E 331 with no water passing the interior face of the window frame and no leakage as defined in the test method, based on 15% of the positive design pressure for all grades except 0.20 times the positive design pressure for AW grade, but not less than 10 lbf/sq.
e. Uniform Load Structural Test: Apply a minimum exterior and interior uniform load of 67.5 pounds per square foot to the entire outside surface of the test unit. Maintain this test load for a period of 10 seconds. Results: No glass breakage, permanent damage of fasteners, hardware parts, support arms, actuating mechanisms, or any other damage causing the window to be inoperable. And no permanent deformation of any frame or vent member in excess of 0.4 percent of its span.

4. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   a. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces

C. THERMAL PERFORMANCE: Comply with following:
1. U Value Simulation: Thermal computer simulation per NFRC 100-04, at the prescribed 48” x 60” Non-Residential Size, glazed with 7/8” insulating glass made with 1/8” clear exterior glass lite, thermoplastic butyl spacer, argon gas, and 1/8” glass with a soft coat low E coating on the #3 surface of the interior lite: Thermal Transmittance to be maximum 0.38 BTU/HR/Sq.FT/°F.
2. Condensation Resistance Simulation: Thermal computer simulation per NFRC 500-04, at the prescribed 48” x 60” Non-Residential Size, glazed with 7/8” insulating glass made with 1/8” clear exterior glass lite, thermoplastic butyl spacer, argon gas, and 1/8” glass with a soft coat low E coating on the #3 surface of the interior lite.
   a. Condensation Resistance to be minimum 50.

2.03 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8 mm) wall thickness at any location for the main frame and sash members.

B. Thermal Barrier: The thermal barrier shall consist of integral structural thermal break made with glass-reinforced nylon strips installed continuously and mechanically bonded to the aluminum.

C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

F. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.04 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.

B. Single Hung Window Typical Hardware:
   1. Typical Hardware:
      a. White zinc die cast Sweep Lock
      b. Zinc Pivot Bars
      c. White nylon Custodial Tilt Releases

2.05 ACCESORIES

A. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

B. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

C. Sealants and joint fillers for joints at perimeter of window system as specified in Division 7 Section “Joint Sealants”.

D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

E. Muntin Grids: Extruded aluminum profiles, 6063-T6 alloy and temper and as follows:
   1. Between the glass muntins.
   2. Width: 1 inch.
   3. Configuration: as shown.

F. Exterior Panning: Extruded aluminum, 6063-T6 alloy and temper, extruded to profiles and details indicated. Seal exterior joints with manufacturer's standard sealant to assure water-tight joints.
   1. Exterior Panning and Trims: All panning profiles shall be a minimum thickness of 0.062" (1.57 mm) to match the profiles as shown the drawings. Any profile variations shall be submitted to the architect and/or owner for approval 10 days prior to bid date. All panning

shall be factory fabricated for field assembly. All corner joinery shall be factory mitered. Joinery at the sill shall be coped and butt-type construction. All preparations for assembly shall be completed by the window manufacturer. Upon assembly, panning frame joints shall be back-sealed to prevent moisture penetration.

G. Coupling Mullions: Shall be extruded aluminum of 6063-T6 alloy and temper of profile and dimensions indicated on drawings. Mullions shall provide structural properties to resist wind pressure required by performance criteria and standards.

H.

2.06 FABRICATION

A. 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 fit joints; make joints flush, hairline and weatherproof.
   3. Means to drain water passing joints, condensation 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. Provisions for field replacement of glazing.
   7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Window Frame Joinery: Mitered and Mechanically clipped and/or staked. Factory sealed frame and corner joints.

C. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

D. Fabricate aluminum windows that are re-glazable without dismantling sash or framing.

E. Thermally Broken Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier. Thermal barriers shall be designed in accordance with AAMA TIR A8.
   1. Thermal Barrier: The thermal barrier shall consist of integral structural thermal break made with glass-reinforced nylon strips installed continuously and mechanically bonded to the aluminum.

F. Mullions: Provide mullions and cover plates as shown, matching window units, complete with 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 capable of withstanding design loads of window units.

G. Sub frames: Provide sub frames with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093" (2.4 mm) thick extruded aluminum. Miter or cope corners, and join with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.

H. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements with AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).

I. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match frame.

2.07 GLAZING

A. Glass: Clear insulating-glass units, argon gas filled, with low-E coating and warm edge spacers. Provide tempered glazing where required to comply with code, and where indicated.
   1. Glass thickness: 1/8 inch.
   2. Total thickness: 7/8 inch.
   3. Low-E Coating: SunGuard SNX 62/27 on #2 surface.

B. Glazing System: Manufacturer's standard factory-glazing system with additional wet applied toe bead that produces weather tight seal.

2.08 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
   1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil (0.023 mm); color as selected from manufacturers standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Set sill members and sill flashing in continuous bead of sealant.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Install operating hardware not pre-installed by manufacturer.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft (1.5 mm/m) non-cumulative or 1/8 inches per 10 ft (3 mm/3 m), whichever is less.

3.04 FIELD QUALITY CONTROL

A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E1105 using uniform pressure and the same pressure difference as specified for laboratory testing.
   1. Test one (1) window of each type, for Window Types W1-W7, as directed by Architect. Test one (1) W1 window in exterior mockup wall. Assume up to three (3) mobilizations for window testing.
   2. If any window fails, test additional windows at Contractor's expense.

B. Replace windows that have failed field testing and retest until performance is satisfactory.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes furnishing and installation of door hardware for doors specified in "Hardware Sets" and required by actual conditions. Including screws, bolts, expansion shields, electrified door hardware, and other devices for proper application of hardware.

B. Where items of hardware are not specified and are required for intended service, such omission, error or other discrepancy to be submitted to Architect fourteen calendar days prior to bid date for clarification by addendum.

C. Products supplied but not installed under this Section:
   1. Final replacement of cylinder cores to be installed by Owner.
   2. Hold open wall magnets.
   3. Electrified hardware will be furnished and installed by the security contractor.

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

E. Related Divisions:
   1. Division 08 Openings
   2. Division 13 Special Construction
   3. Division 26 Electrical
   4. Division 28 Electronic Safety And Security

1.02 REFERENCES

A. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI):
   1. ANSI/BHMA A156.1 Butts & Hinges (2006)
   2. ANSI/BHMA A156.3 Exit Devices (2014)
   3. ANSI/BHMA A156.4 Door Controls – Closers (2008)
   4. ANSI/BHMA A156.6 Architectural Door Trim (2010)
   5. ANSI/BHMA A156.7 Template Hinge Dimensions (2009)
   6. ANSI/BHMA A156.8 Door Controls – Overhead Stops and Holders (2010)
   7. ANSI/BHMA A156.13 Mortise Locks & Latches (2005)
   8. ANSI/BHMA A156.16 Auxiliary Hardware (2008)
   9. ANSI/BHMA A156.18 Materials & Finishes (2006)
   10. ANSI/BHMA A156.21 Thresholds (2009)
   11. ANSI/BHMA A156.22 Door Gasketing Systems (2012)
   12. ANSI/BHMA A156.26 Continuous Hinges (2006)
   13. ANSI/BHMA A156.28 Keying Systems (2007)
   14. ANSI/BHMA A156.36 Auxiliary Locks (2010)
   15. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames (2014)
   16. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames (2006)

B. International Code Council/American National Standards Institute (ICC/ANSI)/ADA:
   1. ICC/ANSI A117.1 Standards for Accessible and Usable Buildings and Facilities 2009
   2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

C. Underwriters Laboratories, Inc. (UL):
   1. UL 10C Positive Pressure Fire Test of Door Assemblies
   2. UL 1784 Air Leakage Test of Door Assemblies

3. UL/ULC Listed

D. Door and Hardware Institute (DHI):
1. DHI Publication – Keying Systems and Nomenclature (1989)
2. DHI Publication – Abbreviations and Symbols
3. DHI Publication – Installation Guide for Doors and Hardware
4. DHI Publication – Sequence and Format of Hardware Schedule (1996)

E. National Fire Protection Agency (NFPA)
1. NFPA 70 National Electrical Code 2011
2. NFPA 80 Standard for Fire Doors and Other Opening Protective's 2010
3. NFPA 101 Life Safety Code 2012
4. NFPA 105 Standard for the Installation of Smoke Door Assemblies 2010

F. Building Codes
1. IBC International Building Code 2012
2. Local Building Code

1.03 SUBMITTALS

A. Submit in accordance with Conditions of the Contract and Division 1 Administrative Requirements.

B. Shop Drawings:
1. Organize hardware schedule organized in vertical format illustrated in DHI Publications Sequence and Formatting for the Hardware Schedule. Include abbreviations and symbols page according to DHI Publications Abbreviations and Symbols. Complete nomenclature of items required for each door opening as indicated.
2. **Include lock, latch or trim function (Entry, Classroom, Passage, etc.) in the product description under the Hardware Headings to matching the actual function as indicated by the product catalog number.**
3. Coordinate final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of hardware.
4. Architectural Hardware Consultant (AHC), as certified by DHI, who shall affix seal attesting to completeness and correctness, shall review hardware schedule prior to submittal.

C. Submit manufacturer's catalog sheet on design, grade and function of items listed in hardware schedule. Identify specific hardware item per sheet, provide index, and cover sheet.

D. Coordination: Distribute door hardware templates to related divisions within fourteen days of receiving approved door hardware submittals.

E. Closeout Submittals: Submit to Owner in a three ringed binder or CD if requested.
1. Warranties.
2. Maintenance and operating manual.
3. Maintenance service agreement.
4. Record documents.
5. Copy of approved hardware schedule.
6. Copy of approved keying schedule with bitting list.
7. Door hardware supplier name, phone number and fax number.

1.04 QUALITY ASSURANCE

A. Hardware supplier shall employ an Architectural Hardware Consultant (AHC) as certified by DHI and a member of the seal program who shall be available at reasonable times during course of work for Project hardware consultation.

B. Door hardware conforming to ICC/ANSI A117.1. : Handles, Pulls, Latches, Locks and operating devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.

C. Fire Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and or labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C, unless otherwise indicated.

D. Fire Door Inspection: Prior to receiving certificate of occupancy have fire rated doors inspected by an independent certified Fire and Egress Door Assembly Inspector (FDAI), as certified by Intertek (ITS), a written report shall be submitted to Owner and Contractor. Doors failing inspection shall be adjusted, replaced or modified to be within appropriate code requirements.
Use for buildings under IBC 2009

E. Smoke and Draft Control Door Assemblies: Where smoke and draft control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

F. Door hardware certified to ANSI/BHMA standards as noted, participate and be listed in BHMA Certified Products Directory.

G. Substitution request: Include the reason for requesting the substitution, clear catalog copy highlighting the proposed product and options, compliance statement, technical data, product warranty and lead time, to show how the proposed can meet or exceed established level of design function and quality. Approval of request is at the discretion of the owner, architect and their designated consultants.

H. Pre-installation Meeting: Comply with requirements in Division 1 Section "Project Meetings."
   1. Convene meeting seven days before installation. Participants required to attend: Contractor, installer, material supplier, manufacturer representatives, electrical contractor, security consultant and fire alarm consultant.
   2. Include in conference decisions regarding proper installation methods and procedures for receiving and handling hardware.
   3. Review sequence of operation for each type of electrified door hardware, inspect, and discuss electrical roughing-in and other preparatory work performed by other trades.
   4. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

I. Within fourteen days of receipt of approved door hardware submittals contact Owner with representative from hardware supplier to establish a keying conference. Verify keyway, visual key identification, number of master keys and keys per lock. Provide keying system per Owners instructions.

J. Installer Qualifications: Specialized in performing installation of this Section and have five years minimum documented experience.

K. Hardware listed in 3.07- Hardware Schedule is intended to establish type and grade.

1.05 DELIVERY, STORAGE AND HANDLING

A. Provide clean, dry and secure room for hardware delivered to Project but not yet installed.

B. Furnish hardware with each unit marked and numbered in accordance with approved finish hardware schedule. Include door and item number for each type of hardware.

C. Pack each item complete with necessary parts and fasteners in manufacturer's original packaging.

D. Deliver permanent key, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to Owner shall be established at "Keying Conference."

E. Waste Management and Disposal: Separate waste materials for reuse or recycling in accordance with Division 1.

1.06 WARRANTY

A. General Warranty: Owner may have under provisions of the Contract Documents and be an addition and run concurrent with other warranties made by Contractor under requirements of the Contract documents.

B. Special Warranty: Warranties specified in this article shall not deprive Owner of other rights. .
   1. Ten years for manual door closers.
   2. Five years for mortise, auxiliary and bored locks.
   3. Five years for exit devices.
   4. One year for electromechanical door hardware.

C. Replace or repair defective products during warranty period in accordance with manufacturer's warranty at no cost to Owner. There is no warranty against defects due to improper installation, abuse and failure to exercise normal maintenance.

D. Maintenance Tool and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, removal and replacement of door hardware.

PART 2 – PRODUCTS

2.01 HINGES

A. Hinges, electric hinges of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Products to be certified and listed by the following:
   1. Butts and Hinges: ANSI/BHMA A156.1
   2. Template Hinge Dimensions: ANSI/BHMA A156.7

C. Butt Hinges:
   1. Hinge weight and size unless otherwise indicated in hardware sets:
      a. Doors up to 36" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .134" and a minimum of 4-1/2" in height.
      b. Doors from 36" wide up to 42" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .145" and a minimum of 4-1/2"" in height.
      c. For doors from 42" wide up to 48" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .180" and a minimum of 5" in height.
      d. Doors greater than 1-3/4" thick provide hinges with a minimum thickness of .180" and a minimum of 5" in height.
      e. Width of hinge is to be minimum required to clear surrounding trim.

   2. Base material unless otherwise indicated in hardware sets:
      a. Exterior Doors: 304 Stainless Steel, Brass or Bronze material.
      b. Interior Doors: Steel material.
      c. Fire Rated Doors: Steel or 304 Stainless Steel materials.
      d. Stainless Steel ball bearing hinges to have stainless steel ball bearings. Steel ball bearings are unacceptable.

3. Quantity of hinges per door unless otherwise stated in hardware sets:
   a. Doors up to 60”in height provide 2 hinges.
   b. Doors 60” up to 90” in height provide 3 hinges.
   c. Doors 90” up to 120” in height provide 4 hinges.
   d. Doors over 120” in height add 1 additional hinge per each additional 30” in height.
   e. Dutch doors provide 4 hinges.

4. Hinge design and options unless otherwise indicated in hardware sets:
   a. Hinges are to be of a square corner five-knuckle design, flat button tips and have ball bearings unless otherwise indicated in hardware sets.
   b. Out-swinging exterior and out-swinging access controlled doors shall have non-removable pins (NRP) to prevent removal of pin while door is in closed position.
   c. When full width of opening is required, use hinges that are designed to swing door completely from opening when door is opened to 95 degrees.
   d. Electric Through Wire (ETW) to have appropriate number of wires to transfer power through door frame to door for proper connection of finish hardware and certified to handle an amperage rating of 3.5AMPS/continuous duty with 16.0AMPS/intermittent duty.
   e. Provide mortar boxes for frames that require any electrically modified hinges if not an integral part of frame.
   f. When shims are necessary to correct frame or door irregularities, provide metal shims only.

5. Acceptable Manufacturers:

		Standard Weight	Heavy Weight
a.	Hager Companies	BB1279/BB1191	BB1168/BB1199
b.	Bommer	BB5000/BB5002	BB5004/BB5006
c.	McKinney	TA2714/TA2314	T4A3786/T4A3386

2.02 CONTINUOUS HINGES

A. Continuous hinges of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Products to be certified and listed by the following: Continuous Hinges: ANSI/BHMA A156.26 Grade 1

C. Continuous Geared Hinges:
   1. Determine model number by door and frame application, door thickness, frequency of use, and fire rating requirements according to manufacturer’s recommendations.
      a. Length of hinge shall be 1” less door height unless otherwise stated in hardware sets.

D. Material and Design:
   1. Base material: Anodized aluminum manufactured from 6063-T6 material, unexposed working metal surfaces shall be coated with TFE dry lubricant
   2. Bearings:
      a. Vertical loads shall be carried on Lubriloy RL bearings for non Fire Rated doors.
      b. Continuous hinges shall have a minimum spacing between bearings of 2-9/16”. Typical door from 80” to 84” in height to have a minimum of 32 bearings.
   3. Options:
      a. Removable Electric Through-Wire (RETW) shall have appropriate number of wires to transfer power through door frame to door for proper connection of finish hardware. Provide RETW in a form that can be removed for connection, servicing without removing entire hinge from door and frame, and certified to handle an amperage rating of 3.5AMPS/continuous duty with 16.0AMPS/intermittent duty.

b. When full width of opening is required, use hinges that are designed to swing door completely from opening when door is opened to 95 degrees.
c. Fire rated hinges shall carry UL certification, up to and including 90-minute applications for wood doors and up to 3-hour applications for metal doors.

E. Acceptable Manufacturers:

		Heavy Duty
1.	Hager Companies	780-224HD
2.	Bommer	FM120HD
3.	Zero	914A

2.03 FLUSH BOLTS AND COORDINATORS

A. Flushbolts of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be listed by the following: Auxiliary Hardware: ANSI/BHMA A156.16

C. Labeled openings: Provide automatic or constant latching flush bolts per hardware schedule for inactive leaf of pairs of doors. Provide dust proof strikes for bottom bolt.

D. Non-Labeled openings: Provide two flush bolts for inactive leaf of pairs of doors per hardware schedule. Top bolt shall not be more than 78" centerline from floor. Provide dust proof strike for bottom bolt.

E. Acceptable Manufacturers:

		Manual Flush Bolt	Auto Flush Bolt	Dust Proof Strike
1.	Hager Companies	282D	292D/295W/296W	280X
2.	Rockwood	555	1942	570
3.	Trimco	3917	3815	3911

F. Coordinators: Provide for labeled pairs of doors with automatic flush bolts or with vertical rod exit device with a mortise-locking device per hardware schedule. Provide filler piece to extend full width of stop on frame. Provide mounting brackets for closers and special preparation for latches where applicable.

G. Acceptable Manufacturers:

		Coordinator	Bracket	Bracket for stops greater than 2-1/4"
1.	Hager Companies	297	297M	297N
2.	Rockwood	1600	1601AB	1601C
3.	Trimco	3094	3095	3096

2.04 REMOVABLE MULLIONS

A. Keyed and non-keyed removable mullions of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be listed by the following: UL/cUL/Warnock Hersey for fire rated pairs of doors up to 8 feet tall x 8 feet wide opening.

C. Material and Design:
1. For use with rim exit devices on non-rated and fire rated pairs of doors. Mullion 2"x 3"x 11 gage steel tube.
2. Top Fitting:
   a. Mullion locked in place without use of a key.
   b. Deadlock on fire rated device

D. Acceptable manufacturers for keyed removable mullions:

	Keyed Fire Rated	Keyed Non-Fire Rated
1. Hager Companies:	4900TF	4900T
2. Von Duprin:	KR9954	KR4954
3. Sargent:	12- L980	L980S

E. Acceptable manufacturers for removable mullions:

	Fire Rated	Non-Fire Rated
4. Hager Companies:	4900UF	4900U
5. Von Duprin:	9954	4954
6. Sargent:	12- 980	980S

2.05 LOCKS AND LATCHES (GRADE 1 MORTISE)

A. Locks and latches of one manufacturer as listed for continuity of design and consideration of warranty.

B.
1. ANSI/BHMA A156.13 Series 1000 Certified to Grade 1 for Operational and Security.
2. UL/cUL Labeled and listed up to 3 hours for single doors up to 48" in width and up to 96" in height.
3. UL10C/UBC 7-2 Positive Pressure Rated.
4. ICC/ANSI A117.1.

C. Lock and latch function numbers and descriptions of manufactures series as listed in hardware sets.

D. Material and Design:
1. Lock cases from fully wrapped, 12 gauge steel, Zinc dichromate for corrosion resistance.
2. Non-handed, field reversible without opening lock case.
3. Break away spindles to prevent unlocking during forced entry or vandalism.
4. Levers, Zinc cast, Forged Brass or Stainless Steel and plated to match finish designation in hardware sets.
5. Sectional Roses, solid Brass or Stainless Steel material and have a minimum diameter of 2-7/16".
6. Escutcheons, of solid Brass or Stainless Steel material.
7. Armor fronts, self-adjusting to accommodate a square edge door or a standard 1/8" beveled edge door.

E. Latch and Strike:
1. Stainless Steel latch bolt with minimum of ¾" throw and deadlocking for keyed and exterior functions.
2. Strike is to fit a standard ANSI A115 prep measuring 1-1/4" x 4-7/8" with proper lip length to protect surrounding trim.
3. Deadbolts to be 1-3/4" total length with a minimum of a 1" throw and ¾" internal engagement when fully extended and made of Stainless Steel material.

H. Acceptable Manufacturers:
1. Hager Companies: 3800 Series.
2. Corbin Russwin: ML2000 Series

2.06 MORTISE DEADBOLTS

A. Mortise **d**eadbolts of one manufacturer as listed for continuity of design and consideration of warranty.

B Standards: Manufacturer to be certified by the following:

1. ANSI/BHMA A156.13 Series 2000 Grade 1 Operational and Security
2. UL/cUL listed for functions up to 3 hours for “A” label
3. UL10C/UBC 7-2 Positive Pressure Rated
4. ADA - Thumbturn

C. Deadbolt function numbers and descriptions of manufactures series as listed in hardware sets.

D. Material and Design:
1. Latch bolt projection 1”throw
2. Case steel, zinc dichromate
3. Armor front 5-9/16”, case dimension 4-5/16” x 3-9/16” x 1”

E. Acceptable Manufacturers:
1. Hager Companies: 3830 Series.
3. Sargent: 4870 Series

2.07 EXIT DEVICES (GRADE 1)

A. Exit Devices of one manufacturer as listed for continuity of design and consideration of warranty. Touch pad type, finish to match balance of door hardware

B. Standards: Manufacturer to be certified and or listed by the following:
1. BHMA Certified ANSI A156.3 Grade 1
2. UL/cUL Listed for up to 3 hours for “A” labeled doors
3. UL10C/UBC 7-2 Positive Pressure Rated
4. UL10B Neutral Pressure Rated
5. UL 305Listed for Panic Hardware

C. Material and Design:
1. Touch pad shall extend a minimum of one half-door width. Freewheeling lever design shall match design of locks levers. Exit device to mount flush with door.
2. Latchbolts:
   a. Rim device – ¾” throw, Pullman type with automatic dead-latching, stainless steel
   b. Surface vertical rod device – Top ½” throw, Pullman type with automatic dead-latching, stainless steel. Bottom ½” throw, Pullman type, held retracted during door swing, stainless steel.
3. Fasteners: Wood screws, machine screws and thru-bolts.

D. Lock and Latch Functions: Function numbers and descriptions of manufacturer’s series and lever styles indicated in door hardware sets.

E. Acceptable Manufacturers:
1. Hager Companies: 4500 Series
2. Corbin Russwin: Series

2.08 CYLINDERS AND KEYING

A. Cylinders of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer shall meet the following:
1. Auxiliary Locks: ANSI/BHMA A156.5
2. DHI Handbook “Keying systems and nomenclature” (1989)

C. Cylinders:
1. Manufacturer’s standard tumbler type, IC core to match existing system.
2. Furnish with cams/tailpieces as required for locking device that is being furnished for project.

D. Keying:
   1. Conduct a keying meeting the owner's representative, to establish their requirements.
   2. Copy of Owners approved keying schedule submitted to Owner and Architect with documentation of which keying conference was held and Owners sign-off.
   3. Provide a bitting list to Owner of combinations as established, and expand to twenty five percent for future use or as directed by Owner.
   4. Key into Owner's existing keying system.
   5. Keys to be shipped to Owner's representative, individually tag per keying conference.
   6. Provide visual key control identification on keys.
   7. Provide interchangeable cores with construction cores as required per hardware schedule.

E. Acceptable manufacturers:
   1. Corbin Russwin

2.09 PUSH/PULL PLATES AND BARS

A. Push/Pull plates and bars of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be certified by the following:
   1. Architectural Door Trim: ANSI/BHMA A156.6
   2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

C. Push plates: .050" thick, square corner and beveled edges with counter sunk screw holes. Width and height as stated in hardware sets.

D. Acceptable Manufacturers:
   1. Hager Companies: 30S
   2. Rockwood
   3. Trimco

E. Pull plates: .050" thick, square corner and beveled edges. Width and height as stated in hardware sets, ¾" diameter pull, with clearance of 2-1/2" from face of door.

F. Acceptable Manufacturers:
   1. Hager Companies: H33J
   2. Rockwood
   3. Trimco

G. Push Pull Bar Sets: 1" round bar stock with 2 ½" clearances from face of door. Offset 3", 90-degree standard. Center to center size should be door width less 1 stile width.

H. Acceptable Manufacturers:
   1. Hager Companies: 137D
   2. Rockwood
   3. Trimco

2.10 CLOSERS (CAST IRON BODY GRADE 1)

A. Closers of one manufacturer as listed for continuity of design and consideration of warranty. Unless otherwise indicated on hardware schedule, comply with manufacturer's recommendation for size of closer, depending on width of door, frequency of use, atmospheric pressure, ADAAG requirements, and fire rating.

B. Standards: Manufacturer to be certified and or listed by the following:
   1. BHMA Certified ANSI A156.4 Grade 1
   2. ADA Compliant ANSI A117.1

3. UL/cUL Listed up to 3 hours.
4. UL10C Positive Pressure Rated
5. UL10B Neutral Pressure Rated

C. Material and Design:
1. Provide cast iron non-handed bodies with full plastic covers.
2. Closers shall have separate staked adjustable valve screws for latch speed, sweep speed, and backcheck.
3. Provide Tri-Pack arms and brackets for regular arm, top jamb, and parallel arm mounting.
4. One-piece seamless steel spring tube sealed in hydraulic fluid.
5. Double heat-treated steel tempered springs.
6. Precision-machined heat-treated steel piston.
7. Triple heat-treated steel spindle.
8. Full rack and pinion operation.

D. Mounting:
1. Out swing doors use surface parallel arm mount closers except where noted on hardware schedule.
2. In swing doors use surface regular arm mount closers except where noted on hardware schedule.
3. Provide brackets and shoe supports for aluminum doors and frames to mount fifth screw.
4. Furnish drop plates where top rail conditions on door do not allow for mounting of closer and where backside of closer is exposed through glass.

E. Size closers in compliance with requirements for accessibility (ADDAG). Comply with following maximum opening force requirements.
1. Interior hinged openings: 5.0 lbs.
2. Fire rated and exterior openings use minimum opening force allowable by authority having jurisdiction.

F. Fasteners: Provide self-reaming and self-tapping wood and machine screws and sex nuts and bolts for each closer.

G. Acceptable manufacturers:
1. Hager Companies: 5100 Series
2. Corbin Russwin

2.11 CLOSERS (ALUMINUM BODY GRADE 1)

A. Closers of one manufacturer as listed for continuity of design and consideration of warranty. Unless otherwise indicated on hardware schedule, comply with manufacturer's recommendations for size of closer, depending on width of door, frequency of use, atmospheric pressure, ADAAG requirements, and fire rating.

B. Standards: Manufacturer to be certified by the following:
1. BHMA Certified ANSI A156.4 Grade 1
2. ADA Complaint ANSI A117.1
3. UL/cUL Listed up to 3 hours
4. UL10C Positive Pressure Rated
5. UL10B Neutral Pressure Rated

C. Material and Design:
1. Provide aluminum non-handed bodies with full plastic covers.
2. Closer, separate staked adjustable valve screws for latch speed, sweep speed, and backcheck.
3. Provide Tri-Pack arms and brackets for regular arm, top jamb, and parallel arm mounting.
4. Double heat-treated steel, tempered springs.

5. Precision machined, heat-treated steel piston.
6. Triple heat-treated steel spindle.
7. Full rack and pinion operation.

D. Mounting:
1. Out swing doors surface parallel arm mount closers except where noted on hardware schedule.
2. In swing doors surface regular arm mount closers except where noted on hardware schedule.
3. Provide brackets and shoe supports for aluminum doors and frames to mount fifth screw.
4. Furnish drop plates where top rail conditions on door do not allow for mounting of closer and where backside of closer is exposed through glass.

E. Size closers in compliance with requirements for accessibility (ADDAG). Comply with following maximum opening force requirements.
1. Interior hinged openings: 5.0 lbs.
2. Fire rated and exterior openings shall have minimum opening force allowable by authority having jurisdiction.

F. Fasteners: Provide self-drilling and tapping wood screws, machine screws and sex nuts and bolts for each closer.

G. Acceptable manufacturers:
1. Hager Companies: 5200 Series
2. Norton 8000 Series

2.12 PROTECTIVE TRIM

A. Protective trim of one manufacturer as listed for continuity of design and consideration of warranty.

B. Size of protection plate: Single doors, size two inches less door width (LDW) on push side of door, and one inch less on pull side of door. For pairs of doors, size one inch less door width (LDW) on push side of door, and ½ inch on pull side of door.
1. Kickplates 10” high or sized to door bottom rail height

C. Standards: Manufacturer shall meet requirements for:
1. Architectural Door Trim: ANSI/BHMA A156.6
2. UL

D. Material and Design:
1. 0.050” gage stainless steel
2. Corners square, polishing lines or dominant direction of surface pattern shall run across door width of plate.
3. Bevel top, bottom and sides uniformly leaving no sharp edges.
4. Provide countersink holes for screws for all protection plates. Screws holes shall be spaced equidistant eight inches CTC, along a centerline not over ½ inch in from edge around plate. End screws maximum of 0.53 inch from corners.

E. UL label stamp required on protection plates when top of plate is more than 16 inches above bottom of door on fire rated openings. Verify door manufactures UL listing for maximum height and width of protection plate to be used.

F. Acceptable Manufacturers:
1. Hager Companies: 190S
2. Trimco
3. Burns

2.13 STOPS AND HOLDERS

A. Stops and holders of one manufacturer as listed for continuity of design and consideration of warranty.

B. Wall Stops: Provide door stops wherever necessary to prevent door or hardware from striking an adjacent partition or obstruction. Provide wall stops when possible. Door stops and holders mounted in concrete floor or masonry walls have stainless steel machine screws and lead expansion shields.

C. Standards: Manufacturer shall meet requirements for:
   1. Auxiliary Hardware: ANSI/BHMA A156.16

D. Acceptable Manufacturers:

	Convex	Concave
1. Hager Companies	232W	236W
2. Rockwood		
3. Burns		

E. Overhead Stops and Holders: Provide overhead stop and holders for doors that open against equipment, casework sidelights and other objects that would make wall stops/holders and floor stops/holders inappropriate. Provide sex bolt attachments for mineral core wood door applications.

F. Standards: Manufacturer shall be certified by the following:
   1. Overhead Stops and Holders: ANSI/BHMA A156.8 Grade 1

G. Acceptable Manufacturers:

	Heavy Duty Surface
1. Hager Companies	7000 SRF Series
3. Sargent	590 Series

2.14 ELECTROMAGNETIC HOLDERS

A. Electromagnetic holders of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer shall meet requirements for:
   1. ANSI 156.15 Grade 1
   2. UL/ULC listed
   3. California State Fire Marshall listed (CSFM)
   4. City of New York MEA approved

C. Material and Design:
   1. Provide electromagnetic holders where self-closing fire doors and smoke barrier doors are required to be held open. Electromagnetic holders to be fail safe, when electrical current is interrupted, doors release to close automatically. Holding force 25-40 pounds.

D. Acceptable Manufacturers:
   1. Hager Companies: 380 Series
   2. Rixson

2.15 POWER SUPPLY (for fire alarm connection)

A. Power supplies of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer shall meet requirements for:
   1. UL Listed

C. Design:
   1. Use with modular access control systems
   2. Field selectable filtered and regulated 12 VDC or 24 VDC constant voltage
   3. 1 AMP load capacity
   4. Circuit breaker protected AC input voltage, secondary output PTC protected
   5. Fire alarm input provides simultaneous release of Fail Safe locks and holders
   6. Interface relay
   7. LED status indicators provide information regarding AC input, DC output, and battery backup status
   8. Separate inputs for activation switch on entry and egress and ingress side of opening.
   9. 5 amp hour battery backup
   10. Input 115 VAC (230 VAC optional)
   11. Optional dual 12 VDC or 24 VDC output

D. Acceptable Manufacturer:
   1. Hager Companies 2908

2.16 DOOR GASKETING AND WEATHERSTRIP

A. Door gasketing and weatherstrip of one manufacturer as listed for continuity of design and consideration of warranty.

B. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing where indicated on hardware schedule. Provide non-corrosive fasteners for exterior applications.
   1. Perimeter gasketing: Apply to head and jamb, forming seal between door and frame.
   2. Meeting stile gasketing: Fasten to meeting stiles, forming seal when doors are in closed position.
   3. Door bottoms: Apply to bottom of door, forming seal with threshold or floor when door is in closed position.
   4. Sound Gasketing: Cutting or notching for stop mounted hardware not permitted.
   5. Drip Guard: Apply to exterior face of frame header. Lip length to extend 4” beyond width of door.

C. Standards: Manufacturer shall meet requirements for:
   1. Door Gasketing and Edge Seal Systems: ANSI/BHMA A156.22
   2. BHMA certified for door sweeps, automatic door bottoms, and adhesive applied gasketing. (721)

D. Smoke-Labeled Gasketing: Comply with NFPA 105 listed, labeled, and acceptable to authorities having jurisdiction, for smoke control indicated.
   1. Provide smoke labeled gasketing on 20 minute rated doors and on smoke rated doors.

E. Fire-Rated Gasketing: Comply with NFPA 80 listed, labeled, and acceptable to Authorities Having Jurisdiction, for fire ratings indicated.

F. Refer to Section 08 1416 Wood Doors for Category A or Category B. Comply with UBC 7-2 and UL10C positive pressure where frame applied intumescent seals are required. Provide Hager # 720 for single and 720 x 724 for a pair of doors.

G. Acceptable Manufacturers:

1. Perimeter Gasketing:

	Adhesive Applied
a. Hager Companies:	726
b. K.N. Crowder:	
c. Reese:	

2. Meeting Stile Weatherstrip:

a. Hager Companies:	872SN
b. K.N. Crowder:	
c. Reese:	

3. Door Bottom Sweeps:

a. Hager Companies:	770S
b. K.N. Crowder:	
c. Reese:	

4. Overhead Drip Guard

a. Hager Companies:	810S
b. K.N. Crowder:	
c. Reese:	

2.17 THRESHOLDS

A. Thresholds of one manufacturer as listed for continuity of design and consideration of warranty.

B. Set thresholds for exterior and acoustical openings in full bed of sealant with lead expansion shields and stainless steel machine screws complying with requirements specified in Division 7 Section "Joint Sealants". Notched in field to fit frame by hardware installer. Refer to Drawings for special details.

C. Standards: Manufacturer to be certified by the following:
   1. Thresholds: ANSI/BHMA A156.21
   2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

D. Acceptable Manufacturers:
   1. Hager Companies: 412S
   2. K.N. Crowder
   3. Reese

2.59 SILENCERS

A. Where smoke, light, or weather seal are not required, provide three silencers per single door frame, two per double door frame and four per Dutch door frame.

B. Standards: Manufacturer shall meet requirements for:
   1. Auxiliary Hardware: ANSI/BHMA A156.16

C. Acceptable Manufacturers:

	Hollow Metal Frame	Wood Frame
1. Hager Companies:	307D	308D
2. Rockwood:		
3. Trimco:		

2.63 FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if within range of approved Samples. Noticeable variations in the same piece are not

acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples.

B. Comply with base material and finish requirements indicated by ANSI/BHMA A156.18 designations in hardware schedule.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.02 INSTALLATION

A. Install hardware per manufacturer's instructions and in compliance with:
   1. NFPA 80.
   2. NFPA 105.
   3. ICC/ANSI A117.1.
   4. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames
   5. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames
   6. DHI Publication – Installation Guide for Doors and Hardware
   7. UL10C/UBC7-2
   8. Local building code.
   9. Approved shop drawings.
   10. Approved finish hardware schedule.

B. Do not install surface mounted items until finishes have been completed on substrates involved. Set unit level, plumb and true to line location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

3.03 FIELD QUALITY CONTROL

A. Material supplier to schedule final walk through to inspect hardware installation ten business days before final acceptance of Owner. Material supplier shall provide a written report detailing discrepancies of each opening to General Contractor within seven calendar days of walk through.

3.04 ADJUSTMENT, CLEANING AND DEMONSTRATING

A. Adjustment: Adjust and check each opening to ensure proper operation of each item of finish hardware. Replace items that cannot be adjusted to operate freely and smoothly or as intended for application at no cost to Owner.

B. Cleaning: Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no cost to Owner.

C. Demonstration: Conduct a training class for building maintenance personnel demonstrating the adjustment, operation of mechanical and electrical hardware. Special tools for finished hardware to be turned over and explained usage at this meeting.

3.05 PROTECTION

A. Leave manufacturer's protective film intact and provide proper protection for all other finish hardware items that do not have protective material from the manufacture until Owner accepts Project as complete.

3.06 HARDWARE SET SCHEDULE

A. Guide: Door hardware items have been placed in sets which are intended to be a guide of design, grade, quality, function, operation, performance, exposure, and like characteristics of door hardware, and may not be complete. Provide door hardware required to make each set complete and operational.

B. Hardware schedule does not reflect handing, backset, method of fastening and like characteristics of door hardware and door operation.

C. Review door hardware sets with door types, frames, sizes and details on drawings. Verify suitability and adaptability of items specified in relation to details and surrounding conditions.

3.07 HARDWARE SCHEDULE

Set #1

Door Numbers: ELJ101, ELJ201
Each opening to receive:

Qty.	Type	Description	Finish	
All hardware part by elevator manufacturer as part of the elevator assembly				

Set #2

Door Numbers: HS101A, J101BA, J109, J225A, J225B, J228, J219A
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5" x 4.5"	US26D	HAG
1 ea.	Classroom Intruder Lock	3871 SECT ARC Less Cylinders	US26D	HAG
2 ea.	Cylinders	Match existing IC system	US26D	CR
1 ea.	Kick Plate	190S 10" x 2" LDW	US32D	HAG
1 ea.	Wall Stop	236W	US32D	HAG
1 ea.	Gasket	726S	Char.	HAG

Set #2A

Door Numbers: J119, J201A, J118AA, J205
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5" x 4.5"	US26D	HAG
1 ea.	Classroom Intruder Lock	3871 SECT ARC Less Cylinders	US26D	HAG
2 ea.	Cylinders	Match existing IC system	US26D	CR
1 ea.	Closer	5200 MLT	ALM	HAG
1 ea.	Kick Plate	190S 10" x 2" LDW	US32D	HAG
1 ea.	Wall Stop	236W	US32D	HAG
1 ea.	Gasket	726S	Char.	HAG
1 ea.	Door Lite Privacy Screen	Velo PS-size to door lite	TBD	AL

Set #3

Door Numbers: J100EA, J100EB, J100EC, STA01B, STA01C, STB01B, KV101A, KV102A
Each opening to receive:

Qty.	Type	Description	Finish	
1 ea.	Continuous Hinges	780-224 HD	Clear	HAG
1 ea.	Electric Continuous Hinges	780-224 HD RETW	Clear	HAG
1 ea.	Keyed Removable Mullion	4900T	USP	HAG
1 ea.	Rim Panic	By Division 28 (compatible with MLR device)		
1 ea.	MLR Rim Panic with reader	By Division 28		
2 ea.	Off-Set Pulls	11J	US32D	HAG
1 ea.	Cylinder	Match existing IC system (KRM)	US26D	CR
1 ea.	Cylinder	Match existing IC system (Key Bypass)	US26D	CR
2 ea.	Closers	5100 HDCS	ALM	HAG
2 ea.	Drop Plates	5110 (as required)	ALM	HAG
2 ea.	Kick Plates	190S 10" x 2" LDW	US32D	HAG
1 ea.	Threshold	412S door opening width	MIL	HAG
2 ea.	Gasket	726 head and jambs/mullion	Char.	HAG
2 ea.	Sweep	770S B door width	MIL	HAG
1 ea.	Drip	810S	MIL	HAG

120VAC power, conduit and wiring by Division 26.
Card Reader and devices by Division 28.
Description or Operation: Doors normally closed and locked. Key retracts latch. Removing key leaves door locked. Access at card reader upon proper credential validation. In the event of a power failure the door remains locked (fail secure). Free egress at all times.

Set #4

Door Numbers: J100ED, J100EF
Each opening to receive:

Qty.	Type	Description	Finish	
2 ea.	Continuous Hinges	780-224 HD	Clear	HAG
2 ea.	Flush Bolts	282D	US26D	HAG
1 ea.	Mortise Aux Deadbolt (Dbl. Cyl.)	3837 less Cylinder	US26D	HAG
2 ea.	Cylinder	Match existing IC system (D/B)	US26D	CR
2 ea.	Off-Set Pulls with Push Bar	157D	US32D	HAG
2 ea.	Closers	5100 HDCS	ALM	HAG
2 ea.	Drop Plates	5110 (as required)	ALM	HAG
1 ea.	Threshold	412S door opening width	MIL	HAG
2 ea.	Gasket	726 head and jambs/mullion	Char.	HAG
1 set	Astragal Weather-strip	872S N (2x) door height	CLR	HAG
2 ea.	Sweep	770S door width	MIL	HAG
1 ea.	Drip	810S	MIL	HAG

Set #5

Door Numbers: J100EG
Each opening to receive:

Qty.	Type	Description	Finish

All hardware by Won Door fire door assembly

Set #6

Door Numbers: J101A, J101BB, J102, J104, J105, J106A, J106B, J107, J107A, J108, J110, J111, J112, J113, J114, J115A, J115B, J116, J127A, J201, J206, J207, J208, J208A, J209, J210, J211, J213, J214, J215, J216, J218, J220, J225 Classroom, IDF, Offices
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Card reader Lock	By Division 28		
1 ea.	Cylinder	Match existing IC system (key by-pass)	US26D	CR
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Closer	5200 MLT	ALM	HAG
1 ea.	Closer	5200 HDCS (J108, J209)	ALM	HAG
1 ea.	Wall Stop	236W	US32D	HAG
1 ea.	Gasket	726S	Char.	HAG
1 ea.	Door Lite Privacy Screen	Velo PS-size to door lite	TBD	AL

Set #7

Door Numbers: J101C, J103, J110A, J224, J233, J235 Toilet Room
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Privacy Lock w/Indicator	3896 SECT ARC	US26D	HAG
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Closer	5200	ALM	HAG
1 ea.	Wall Stop	236W	US32D	HAG
1 ea.	Gasket	726S	Char.	HAG

Set #7A

Door Numbers: J120A, J120B Toilet Room w/reader
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Card reader Lock with Privacy	By Division 28		
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Closer	5200	ALM	HAG
1 ea.	Wall Stop	236W	US32D	HAG
1 ea.	Gasket	726S	Char.	HAG

Set #8

Door Numbers: J104A, J105A
Each opening to receive:

Qty.	Type	Description	Finish

All hardware by coiling door manufacturer as part of the assembly.

Set #9

Door Numbers: J123, J202, J216B, J218A, J220A, J223, J118BA, J118CA Custodial, Closets
Each opening to receive:

Qty.	Type	Description	Finish

3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Storeroom Lock	3880 SECT ARC Less Cylinder	US26D	HAG
1 ea.	Cylinders	Match existing IC system	US26D	CR
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Wall Stop	236W	US32D	HAG
3 ea.	Silencers	307D	Gray	HAG

Set #10

Door Numbers: J124, ELJ102
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Classroom Lock	3870 SECT ARC Less Cylinder	US26D	HAG
1 ea.	Cylinder	Match existing IC system	US26D	CR
1 ea.	Closer	5200 MLT	ALM	HAG
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Wall Stop	236W	US32D	HAG
3 ea.	Silencers	307D	Gray	HAG

Set #11

Door Numbers: J125
Each opening to receive:

Qty.	Type	Description	Finish	
6 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
2 ea.	Flush Bolts	282D	US26D	HAG
1 ea.	Storeroom Lock	3880 SECT ARC Less Cylinder	US26D	HAG
1 ea.	Cylinder	Match existing IC system	US26D	CR
1 ea.	O.H. Holder	7017 SRF (inactive leaf)	US26D	HAG
1 ea.	Closer	5200 HOTA (active leaf)	ALM	HAG
2 ea.	Kick Plate	190S 10” x 1” LDW	US32D	HAG
2 ea.	Silencers	307D	Gray	HAG

Set #12

Door Numbers: STA01A, STB01A, STA02, STB02, STA01-ALT, STA02-ALT
Each opening to receive:

Qty.	Type	Description	Finish	
6 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
2 ea.	SVR Fire Exit Devices	4501 F SVR LBR with fire bolt	US26D	HAG
2 ea.	Passage Trim	45BE ARC	US26D	HAG
2 ea.	Closer	5200 MLT	ALM	HAG
		(Mount closer for 180 degree swing were applicable)		
2 ea.	Kick Plate	190S 10” x 1” LDW	US32D	HAG
2 ea.	Magnetic Holders	380 Series wall mount	ALM	HAG
1 ea.	Gasket	726 head and jambs	Char.	HAG
1 set	Astragal Weather-strip	872S N (2x) door height	CLR	HAG
1 ea.	Power Supply	2908	-	HAG

120VAC power, conduit and wiring by Division 26.
Description of Operation: Door normally held open. In the event of a fire alarm activation the magnetic holders will release allowing the doors to provide a fire barrier.

Set #13

Door Numbers: J100E, J100G
Each opening to receive:

Qty.	Type	Description	Finish	
5 ea.	Hinges	BB1279 4.5" x 4.5" NRP	US26D	HAG
1 ea.	Electric Hinge	BB1279 4.5" x 4.5" ETW	US26D	HAG
1 ea.	SVR Panic	By Division 28 (compatible with MLR device)		
1 ea.	MLR SVR Panic with reader	By Division 28		
2 ea.	Off-Set Pulls	11J	US32D	HAG
1 ea.	Cylinder	Match existing IC system (NL)	US26D	CR
2 ea.	Closer	5200 MLT	ALM	HAG
2 ea.	Kick Plate	190S 10" x 1" LDW	US32D	HAG
2 ea.	Magnetic Holders	380 Series wall mount	ALM	HAG
1 ea.	Gasket	726 head and jambs	Char.	HAG
1 ea.	Power Supply	2908 (for magnetic holders)	-	HAG

120VAC power, conduit and wiring by Division 26.
Card Reader and devices by Division 28.
Description or Operation: Door normally held open. For selective access during off-hour events the doors are closed and locked. Key retracts latch. Removing key leaves door locked. Access at card reader upon proper credential validation. In the event of a power failure the holders release and the doors remain locked (fail secure). Free egress at all times.

Set #14

Door Numbers: J100J, K102A, K102B, K101G,K101H
Each opening to receive:

Qty.	Type	Description	Finish

Cased Opening – no hardware required

Set #15

Door Numbers: J230
Each opening to receive:

Qty.	Type	Description	Finish	
6 ea.	Hinges	BB1279 4.5" x 4.5"	US26D	HAG
1 set	Automatic Flush Bolts	296W	US26D	HAG
1 ea.	Storeroom Lock	3880 SECT ARC Less Cylinder	US26D	HAG
1 ea.	Cylinder	Match existing IC system	US26D	CR
2 ea.	O.H. Holder	7017 SRF	US26D	HAG
2 ea.	Silencers	307D	Gray	HAG

Set #16

Door Numbers: J115
Each opening to receive:

Qty.	Type	Description	Finish	
1 ea.	Key switch	29KS MDD 2LED	US32D	HAG
1 ea.	Mortise Cylinder	Match existing IC system	US26D	CR

Balance of hardware by vertical folding partition manufacturer as part of the assembly.

Set #17

Door Numbers: J118C
Each opening to receive:

Qty.	Type	Description	Finish	
1 ea.	Electric Continuous Hinges	780-224 HD RETW	Clear	HAG
1 ea.	MLR Rim Panic with reader	By Division 28		
1 ea.	Cylinder	Match existing IC system (Key by-pass)	US26D	CR
1 ea.	Closers	5100 HDCS	ALM	HAG
1 ea.	Drop Plates	5110 (as required)	ALM	HAG
1 ea.	Kick Plates	190S 10" x 2" LDW	US32D	HAG
1 ea.	Threshold	412S door opening width	MIL	HAG
1 ea.	Gasket	726 head and jambs	Char.	HAG
1 ea.	Sweep	770S B door width	MIL	HAG
1 ea.	Drip	810S	MIL	HAG

120VAC power, conduit and wiring by Division 26.
Card Reader and devices by Division 28.
Description or Operation: Door normally closed and locked. Key retracts latch. Removing key leaves door locked. Access at card reader upon proper credential validation. In the event of a power failure the door remains locked (fail secure). Free egress at all times.

Set #18

Door Numbers: KV101B, KV102B
Each opening to receive:

Qty.	Type	Description	Finish	
2 ea.	Continuous Hinges	780-224 HD	Clear	HAG
2 ea.	Dummy Panic Bar	4000D	US26D	HAG
2 ea.	Off-Set Pulls	11J	US32D	HAG
2 ea.	Closers	5100 HDCS	ALM	HAG
2 ea.	Drop Plates	5110 (as required)	ALM	HAG
2 ea.	Kick Plates	190S 10" x 2" LDW	US32D	HAG
1 ea.	Threshold	412S door opening width	MIL	HAG
2 ea.	Gasket	726 head and jambs/mullion	Char.	HAG
2 ea.	Sweep	770S door width	MIL	HAG
1 ea.	Drip	810S	MIL	HAG

Set #19

Door Numbers: K101A, K101B, K101C, K101D
Each opening to receive:

Qty.	Type	Description	Finish	
2 ea.	Continuous Hinges	780-224 HD	Clear	HAG
1 ea.	Keyed Removable Mullion	4900T	USP	HAG
2 ea.	Rim Panic	4501 RIM CD	US32D	HAG
2 ea.	Off-Set Pulls	11J	US32D	HAG
1 ea.	Cylinder	Match existing IC system (KRM)	US26D	CR
1 ea.	Cylinder	Match existing IC system (CD)	US26D	CR
2 ea.	Off-Set Pulls	11J	US32D	HAG
2 ea.	Closers	5100 HDCS	ALM	HAG
2 ea.	Drop Plates	5110 (as required)	ALM	HAG
2 ea.	Kick Plates	190S 10" x 2" LDW	US32D	HAG
1 ea.	Threshold	412S door opening width	MIL	HAG
2 ea.	Gasket	726 head and jambs/mullion	Char.	HAG
2 ea.	Sweep	770S door width	MIL	HAG
1 ea.	Drip	810S	MIL	HAG

Set #20

Door Numbers: K101E
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Classroom Intruder Lock	3871 SECT ARC Less Cylinders	US26D	HAG
2 ea.	Cylinders	Match existing IC system	US26D	CR
1 ea.	Closer	5200 MLT	ALM	HAG
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Wall Stop	236W	US32D	HAG
1 ea.	Gasket	726S	Char.	HAG

Set #21

Door Numbers: J129A, J129B
Each opening to receive:

Qty.	Type	Description	Finish	
2 ea.	Gate closer device	By fence manufacturer		
2 ea.	Rim Panic Devices	4501 RIM (Exit Only)	US32D	HAG
2 ea.	Gate Panic Shroud with mesh to minimize exterior side breach		Match gate color	

A fixed impost, centered in the gate opening, will be required to use two rim panic devices.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

B. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.

C. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

D. Section 08 44 13 - Glazed Aluminum Curtain Walls: Glazing furnished as part of wall assembly.

E. Section 08 51 13 - Aluminum Windows: Glazing furnished by window manufacturer.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).

D. ASTM C1036 - Standard Specification for Flat Glass; 2011.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.

G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2004).

J. ITS (DIR) - Directory of Listed Products; current edition.

K. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

L. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2012.

M. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2014.

N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014.

O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2014.

P. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

Q. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

R. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

T. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

C. Samples: Submit two samples 12 by 12 inch (___ by ___ mm) in size of glass units.

D. Certificate: Certify that products of this section meet or exceed specified requirements.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

C. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Guardian Industries Corp: www.sunguardglass.com.
   2. Pilkington North America Inc: www.pilkington.com/na.
   3. PPG Industries, Inc: www.ppgideascapes.com.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless noted otherwise.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
   2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
   3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 and 16 CFR 1201 criteria.
   4. Impact Resistant Safety Glass: Complies with ANSI Z97.1 and 16 CFR 1201 criteria; Class B/Category I.

2.04 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Type 1 - Vision glazing, with Low-E coating.
   1. Applications: Exterior insulating glass glazing unless otherwise indicated.
   2. Space between lites filled with argon.
   3. Total Thickness: 1 inch (25.4 mm).
   4. Thermal Transmittance (U-Value): 0.24, nominal.
   5. Visible Light Transmittance (VLT): 74 percent, nominal.
   6. Solar Heat Gain Coefficient (SHGC): 0.41, nominal.
   7. Glazing Method: Dry glazing method, gasket glazing.
   8. Basis of Design - Guardian Glass, LLC: www.guardianglass.com.
   9. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
      a. Low-E Coating: SunGuard SNX 62/27 on #2 surface.
   10. Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick.
      a. Coating: No coating on inboard lite.
      b. Glass: Clear.

B. Type 1A -Sealed Insulating Glass Units: Safety glazing:
   1. Applications: Provide this type of glazing in the following locations:
      a. Glazed lites in exterior doors.
      b. Glazed sidelights and panels next to doors.

c. Other locations required by applicable federal, state, and local codes and regulations.
d. Other locations indicated on the drawings.

2. Type: Same as Type 1 except use fully tempered float glass for both outboard and inboard lites.

C. Type 1B -Sealed Insulating Glass Units: Obscure glazing:
1. Applications: Provide this type of glazing in the following locations:
a. Exterior windows in toilet, bathing, and shower rooms.
b. Other locations indicated on the drawings.
2. Type: Same asType 1 except use patterned obscure glass for inboard lite.
a. Pattern: No. 62

D. Type 2 - Spandrel glazing.
1. Applications: Exterior spandrel glazing unless otherwise indicated.
2. Space between lites filled with argon.
3. Basis of Design - Guardian Glass, LLC: www.guardianglass.com.
4. Outboard Lite: Heat-strengthened float glass, 1/4 inch (6.4 mm) thick, minimum.
a. Tint: Clear.
b. Coating: Same as on vision units, on #2 surface.
5. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick.
a. Tint: Clear.
b. Opacifier: Ceramic frit, on #3 surface.
c. Opacifier Color: as selected by Architect from manufacturer's full range.
d. Coating: OpaciCoat 300.
6. Total Thickness: 1 inch (25.4 mm).

E. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another acceptable manufacturer.

F. Substitution Procedures: See Section 01 60 00 - Product Requirements.
1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.05 GLAZING UNITS

A. Type 3 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch (6.4 mm), nominal.
5. Locations: Interior vision panels, doors and sidelites.
6. Type 3A: Same as Type 3 except use patterned obscure glass.
a. Pattern: No. 62
7. Type 3B: Same as Type 3, except provide opacifier coating on back of glass..
a. Opacifier Coating: OpaciCoat 300
b. Opacifier Color: Custom-mixed color, as selected by Architect.

B. Type 4A - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period of 90 minutes.
1. Applications:
a. Glazing in fire-rated door assembly.
b. Other locations as indicated on drawings.

2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
3. Safety Glazing Certification: 16 CFR 1201 Category II.
4. Fire-Rating Period: 90 minutes.
5. Nominal Thickness: 1-1/2 inch.
6. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
   a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
   b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
   c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
   d. "T" - meets temperature rise of not more than 450 degrees F (232 degrees C) above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
   e. "XXX" - placeholder that represents fire-rating period, in minutes.
7. Products:
   a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL 90: www.safti.com/#sle.
   b. Technical Glass Products; Pilkington Pyrostop 90: www.fireglass.com/#sle.
   c. Substitutions: Refer to Section 01 60 00 - Product Requirements.

C. Type 4B - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period of 60 minutes.
1. Applications:
   a. Glazing in fire-rated door assembly.
   b. Glazing in fire-rated window assembly.
   c. Other locations as indicated on drawings.
2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
3. Safety Glazing Certification: 16 CFR 1201 Category II.
4. Fire-Rating Period: 60 minutes.
5. Nominal Thickness: 7/8 inch.
6. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
   a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
   b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
   c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
   d. "T" - meets temperature rise of not more than 450 degrees F (232 degrees C) above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
   e. "XXX" - placeholder that represents fire-rating period, in minutes.
7. Manufacturers:
   a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL 60: www.safti.com/#sle.
   b. Technical Glass Products; Pilkington Pyrostop 60: www.fireglass.com/#sle.

c. Substitutions: Refer to Section 01 60 00 - Product Requirements.

D. Type 5A - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire-rating period of 60 minutes.
1. Applications:
   a. Glazing in fire-rated door assembly.
   b. Other locations as indicated on drawings.
2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
3. Safety Glazing Certification: 16 CFR 1201 Category II.
4. Fire-Rating Period: 60 minutes.
5. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
   a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
   b. "OH" - meets fire window assembly criteria including hose stream test of NFPA 257, or UL 9 fire test standards.
   c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
   d. "XXX" - placeholder that represents fire-rating period, in minutes.
6. Manufacturers:
   a. SCHOTT North America Inc; Pyran Platinum L: www.us.schott.com/#sle.
   b. Technical Glass Products; Firelite Plus: www.fireglass.com/#sle.
   c. Substitutions: Refer to Section 01 60 00 - Product Requirements.

E. Type 5B - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire-rating period of 45 minutes.
1. Applications:
   a. Glazing in fire-rated door assembly.
   b. Glazing in fire-rated window assembly.
   c. Other locations as indicated on drawings.
2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
3. Safety Glazing Certification: 16 CFR 1201 Category II.
4. Fire-Rating Period: 45 minutes.
5. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
   a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
   b. "OH" - meets fire window assembly criteria including hose stream test of NFPA 257, or UL 9 fire test standards.
   c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
   d. "XXX" - placeholder that represents fire-rating period, in minutes.
6. Products:
   a. SCHOTT North America Inc; Pyran Platinum L: www.us.schott.com/#sle.

b. Technical Glass Products; Firelite Plus: www.fireglass.com/#sle.
c. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.06 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
1. Width: As required for application.
2. Thickness: As required for application.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Verify that sealing between joints of glass framing members has been completed effectively.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - PRESSURE GLAZED SYSTEMS

A. Application - Exterior Glazed: Set glazing infills from exterior side of building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install pressure plates without displacing glazing gasket; exert pressure for full continuous contact.

E. Install cover plate.

3.06 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.07 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 PROTECTION

A. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 83 00
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.
   1. Annealed float glass.

1.02 REFERENCE STANDARDS

A. ASTM C1036 - Standard Specification for Flat Glass; 2011.

B. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

C. GANA (GM) - GANA Glazing Manual; 2009.

D. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors); 2011.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Samples: Submit two samples, 6 x 6 inch (150 x 150 mm) in size, illustrating mirrors edging and coloration.

D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) for glazing installation methods.

1.05 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F (10 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: ASTM C1036, Type 1 - Transparent Flat, Class 1 - Clear, Quality - Q2 (general use mirrors); silvering, protective coating, and quality requirements in compliance with ASTM C1503.
   1. Thickness: 1/4 inch (6 mm).

2. Edges: Polished flat.
3. Size: As noted on drawings.

2.02 ACCESSORIES

A. Mirror Attachment Accessories: Stainless steel J-profile channels and stainless steel clips.

B. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Frameless Mirrors: Set mirrors with stainless steel channels at the bottom, stainless steel clips at the top, and anchor rigidly to wall construction.

3.02 CLEANING

A. Remove labels after work is complete.

B. Clean mirrors and adjacent surfaces.

3.03 SCHEDULE

A. Provide mirrors as shown in the following spaces:
1. Dressing Room C118
2. Dressing Room C119

END OF SECTION

SECTION 08 91 00
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.04 SUBMITTALS

A. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

B. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

C. Samples: Submit two samples 2 by 2 inches (50 by 50 mm) in size illustrating finish and color of exterior and interior surfaces.

D. Test Reports: Independent agency reports showing compliance with specified performance criteria.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 WARRANTY

A. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
   1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Airolite Company, LLC; Model SCH501: www.airolite.com.
   2. Construction Specialties, Inc; Model RSH-5700: www.c-sgroup.com.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.

B. Stationary Storm-Resistant Louvers: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
   1. Free Area: 43%, minimum.
   2. Blades: Airfoil-shaped.
   3. Frame: 5 inches (___ mm) deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
   4. Aluminum Thickness: Frame 12 gage, 0.0808 inch (2.05 mm) minimum; blades 12 gage, 0.0808 inch (2.05 mm) minimum.
   5. Aluminum Finish: Superior performing organic coatings; finish welded units after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.04 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
   1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil (0.023 mm); color and gloss as indicated on drawings.

2.05 ACCESSORIES

A. Blank-Off Panels: Aluminum face and back sheets, polyisocyanurate foam core, 1-1/2 inch (38 mm) thick, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

B. Bird Screen: Interwoven wire mesh of aluminum, 14 gage, 0.0641 inch (1.63 mm) diameter wire, 1/2 inch (13 mm) open weave, diagonal design.

C. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Set sill members and sill flashing in continuous bead of sealant.

D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

F. Coordinate with installation of mechanical ductwork.

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in contract documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Carpet tile.
   3. Thin-set ceramic tile and stone tile.
   4. Terrazzo.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

E. Patching compound.

F. Remedial floor coatings.

1.02 PRICE AND PAYMENT PROCEDURES

A. Unit Price for Remedial Floor Coating or Sheet Membrane: Do not include the cost of the floor coating or underlayment in the base bid; state on the bid form the unit price per square foot (square meter) for the floor coating or underlayment, installed, in the event such remediation is required.
   1. Base the unit price on the assumption that the floor area to be treated is primarily open, not divided into rooms and corridors.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2016a.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Submit report directly to Owner.
   7. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

D. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
   1. Manufacturer's qualification statement.
   2. Manufacturer's statement of compatibility with types of flooring applied over remedial product.
   3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
   4. Manufacturer's installation instructions.
   5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

1.06 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing will be performed by an independent testing agency employed and paid by Owner.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify Owner when specified ambient conditions have been achieved and when testing will start.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
   1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
   2. Products:
      a. Custom Building Products; TechMVC Moisture Vapor and Alkalinity Barrier: www.custombuildingproducts.com/#sle.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
   3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Patching, smoothing, and leveling, as required.
   6. Other preparation specified.
   7. Adhesive bond and compatibility test.
   8. Protection.

B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that

adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.

3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

F. Report: Report the information required by the test method.

3.03 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.04 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.06 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Gypsum sheathing.

E. Cementitious backing board.

F. Gypsum wallboard.

G. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.

B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 21 00 - Thermal Insulation: Acoustic insulation.

D. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire rated walls.

E. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.

D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2017.

E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2016.

F. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.

H. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

I. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

J. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2007a (Reapproved 2015).

K. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2013a.

L. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2017.

M. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

N. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2015.

O. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2013.

P. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

Q. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

R. ASTM E413 - Classification for Rating Sound Insulation; 2016.

S. GA-216 - Application and Finishing of Gypsum Board; 2016.

T. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association; 2016.

U. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

C. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

B. Interior Partitions: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft (0.24 kPa) with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).
      a. Refer to Drawings for UL Assembly Numbers.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
   2. Marino: www.marinoware.com.
   3. Phillips Manufacturing Company: www.phillipsmfg.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
   1. Studs: "C" shaped with flat or formed webs with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.
   4. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).

C. Loadbearing Studs for Application of Gypsum Board: As specified in Section 05 40 00.

D. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

E. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

F. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com.
   3. National Gypsum Company: www.nationalgypsum.com/#sle.
   4. USG Corporation: www.usg.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, 8'-0" and higher, unless otherwise indicated. Use for inner layer of multi-layer applications, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold resistant board is required at all locations.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).
      b. Ceilings: 5/8 inch (16 mm).
   5. Mold Resistant Paper Faced Products:
      a. National Gypsum Company; Gold Bond XP Gypsum Board.
      b. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board..
      c. Lafarge North America Inc; Mold Defense Drywall..
      d. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Abuse Resistant Wallboard:
   1. Application: All locations, 8'-0" and below.
   2. Surface Abrasion: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   4. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
   5. Unfaced Type: Interior fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M.
   6. Type: Fire resistance rated Type X, UL or WH listed.
   7. Thickness: 5/8 inch (16 mm).
   8. Edges: Tapered.
   9. Products:
      a. National Gypsum Company; Gold Bond Hi-Abuse XP Gypsum Board.
      b. National Gypsum Company; Gold Bond HI-Impact XP Gypsum Board.
      c. USG; Fiberock Aqua-Tough Interior Panel..
      d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Backing Board For Wet Areas:
   1. Application: Surfaces behind tile in wet areas including shower room tile installations.
   2. Application: Exterior soffits where textured acrylic finish systems are indicated.
   3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
      a. Thickness: 1/2 inch (12.7 mm).
      b. Products:
         1) Custom Building Products; Wonderboard: www.custombuildingproducts.com.
         2) National Gypsum Company; PermaBase Cement Board: www.nationalgypsum.com/#sle.
         3) USG Corporation; Durock Brand Cement Board: www.usg.com.
         4) Substitutions: See Section 01 60 00 - Product Requirements.

E. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
   1. Application: Vertical surfaces behind thinset tile, except in wet areas.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Type: Type X, in locations indicated.
   5. Type X Thickness: 5/8 inch (16 mm).
   6. Edges: Tapered.
   7. Products:
      a. National Gypsum Company; Gold Bond Hi-Abuse XP Gypsum Board.
      b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer..
      c. USG; Fiberock Aqua-Tough Interior Panel..
      d. Substitutions: See Section 01 60 00 - Product Requirements.

F. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
4. Core Type: Type X, as indicated.
5. Type X Thickness: 5/8 inch (16 mm).
6. Edges: Square.
7. Glass Mat Faced Products:
   a. Georgia-Pacific Gypsum; DensGlass Sheathing.
   b. National Gypsum Company; Gold Bond eXP Sheathing.
   c. CertainTeed Corporation; GlasRoc Brand..
   d. Substitutions: See Section 01 60 00 - Product Requirements.

G. Shaftwall and Coreboard: Type X; 1 inch (25 mm) thick by 24 inches (610 mm) wide, tongue-and-groove long edges, ends square cut.
1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Products:
   a. Georgia-Pacific Gypsum; DensGlass Ultra Shaftliner (mold-resistant).
   b. National Gypsum Company; Gold Bond Brand eXP Shaftliner.
   c. USG Corporation; Sheetrock Gypsum Liner Panels--Enhanced (mold-resistant)..
   d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Resilient Sound Isolation Clips:
1. Molded rubber and steel resilient sound isolation clip: Pliteq GenieClip Resilient Sound Isolation Clip; www.pliteq.com.
2. Projection: 1-5/8 inches from supporting structure, when 7/8-inch drywall furring channels are used.

B. Acoustic Insulation: As specified in Section 07 21 00.

C. Acoustic Sealant: As specified in Section 07 9200; Type 5.

D. Finishing Accessories: ASTM C1047, paper-faced galvanized steel, unless noted otherwise.
1. Types: As detailed or required for finished appearance.

E. Beads, Joint Accessories, and Other Trim: ASTM C1047, Aluminum, unless noted otherwise.
1. Architectural Reveal Beads:
   a. Reveal Depth: 5/8 inch (16 mm).
   b. Reveal Width: 5/8 inch (16 mm).
   c. Shapes: As indicated on drawings.
   d. Products:
      1) Reveals and moldings, as manufactured by Fry Reglet Corporation..
         (a) aluminum reveals and moldings: extruded alloy 6063 T5
         (b) Finish: chemical conversion coating, primed finish, clear anodized or other specified finish.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.

3. Chemical hardening type compound.

G. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
   1. Products:
      a. USG Sheetrock Brand Tuff-Hide Primer-Surfacer.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

H. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

I. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion resistant.

J. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches (600 mm) on center.
   2. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.
   1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
   2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center (at 406 mm on center).
   1. Extend partition framing to structure in all locations.
   2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.
   1. Orientation: Horizontal.
   2. Spacing: At 16 inches (400 mm) on center.

F. Acoustic Furring: Where indicated, install resilient sound isolation clips at maximum 24 inches (600 mm) on center, and in accordance with manufacturer's instructions. Locate joints over framing members.

G. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Wall mounted cabinets.
   3. Plumbing fixtures.
   4. Toilet partitions.
   5. Toilet accessories.
   6. Wall mounted door hardware, including wall stops.
   7. Handrails and wall brackets.
   8. Display cases, markerboards, tack boards.
   9. TV and monitor mounts.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place two beads continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.

C. Double-Layer Non-Rated: Use gypsum board for first layer, placed perpendicular to framing or furring members, with ends and edges occurring over firm bearing. Place second layer parallel to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
   1. Seal joints, cut edges, and holes with water-resistant sealant.

F. Exterior Soffits: Install cementitious backing boards perpendicular to framing, with staggered end joints over framing members or other solid backing.
   1. Seal joints, cut edges, and holes with water resistant sealant.

G. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11-SystemDeleted and manufacturer's instructions.

H. Installation on Metal Framing: Use screws for attachment of gypsum board.

I. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on the drawings. Provide vent area indicated on drawings.

3.07 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.

B. Paper Faced Gypsum Board: Use paper or fiberglass joint tape, bedded with chemical hardening type joint compound and finished with chemical hardening type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive paint finish or wall coverings, in the following locations:
      a. Performing Arts Center Lobby and Vestibules
      b. Middle School Cafeteria
      c. Auditorium
      d. Stairs A and F
      e. Gymnasium Lobbies and Vestibules
      f. All locations with curved gypsum board walls
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Stone thresholds.

D. Trim.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 0561 - Common Work Results for Flooring Preparation

C. Section 09 2116 - Gypsum Board Assemblies: Installation of tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.

B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

C. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).

D. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).

E. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

F. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).

G. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).

H. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).

I. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).

J. ANSI A108.11-SystemDeleted - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).

K. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior glue plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

L. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).

M. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Revised).

N. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar ; 2012.

O. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2013.1.

P. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2017.

1.04 SUBMITTALS

A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

B. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.

C. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Porcelain Tile, Type PFT -1: ANSI A137.1, standard grade.
   1. Size: 2 x 2 inch (____by____ mm), nominal.
   2. Thickness: 1/4 inch (_____ mm).
   3. Surface Finish: Unglazed.
   4. Color(s): As indicated on drawings.
   5. Products: Basis of Design: Daltile
      a. Keystones.

B. Porcelain Tile Wall Tile, Type PT-1, PT-2, PT-12:
   1. Size: 12 by 12 inch, nominal.
   2. Thickness: 3/8 inch.
   3. Color: As indicated on drawings.
   4. Product: Basis of Design: Daltile
      a. Unity

C. Porcelain Tile Wall Tile, Type PT-3, PT-5, PT-9:
   1. Size: 12 x 24 inch (____by____ mm), nominal.
   2. Thickness: 3/8 inch (9.5 mm).
   3. Color: As indicated on drawings.
   4. Product: Basis of Design: Daltile
      a. Portfolio.

D. Porcelain Tile Wall Tile, Type PT-6, PT-10, PT-11:
   1. Size: 6 x 24 inch (____by____ mm), nominal.
   2. Thickness: 3/8 inch (9.5 mm).
   3. Color: As indicated on drawings.
   4. Product: Basis of Design: Daltile
      a. Portfolio.

E. Porcelain Tile Wall Tile, Type PT-6, PT-10, PT-11:
   1. Size: 3 X 12 inch, nominal Bull Nose Trim
   2. Thickness: 3/8 inch
   3. Color(s): As indicated on drawings.
   4. Product: Basis of Design: Daltile
   5. a. Portfolio.

F. Ceramic Wall Tile
   1. Size: 6 X 6 inch nominal
   2. Thickness
   3. Color(s): As indicated on drawings
   4. Product: Basis of Design: Daltile
      a. Semi Gloss and Matte

G. Porcelain Wall base, PTB-1
   1. Extend wall tile to floor (no cove)

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Basis of Design:: Schluter-Systems: www.schluter.com
      a. RONDEC
         1) Brushed Stainless Steel
         2) Finish cap and end trim
   2. Applications:
      a. Inside corners
      b. Outside corners
      c. Top edge

B. Thresholds: Marble, white or gray, honed finish; width as shown by full width of wall or frame opening; 3/4 inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.

2.03 SETTING MATERIALS

A. Latex -Portland Cement (LHT) Large and Heavy Tile Mortar : ANSI A118.4/118.15.
   1. Applications: Use this type of bond coat where indicated with tiles with facial dimension of 15” or greater.
   2. Products:
      a. Custom Building Products; Pro-Lite Premium LHT Mortar.
      b. Custom Building Products; MegsLite Crack Prevention Mortar.
      c. Mapei, Ultraflex 3.

2.04 GROUTS

A. High Performance Grout: ANSI A118.7 polymer modified cement grout.

1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color(s): As selected by Architect from manufacturer's full line.
4. Products:
   a. Custom Building Products; Prism Color Consistent Grout.
   b. Mapei; Ultracolor Plus

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: 100% Silicone Caulk complying with ASTM C920, Class 25, moisture and mildew resistant type.
   1. Applications: Between tile and plumbing fixtures; at control joints.
   2. Color(s): As selected by Architect from manufacturer's full line.
   3. Products:
      a. Custom Building Products; 100 Silicone Caulk.
      b. Approved equal product.

B. Grout Sealant: Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.
   1. Products:
      a. Bonsal, W. R., Company; Grout Sealer.
      b. Bostik; CeramaSeal Grout Sealer.
      c. C-Cure; Penetrating Sealer 978.
      d. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
      e. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
      f. TEC Specialty Products Inc.; TA-256 Penetrating Silicone Grout Sealer.”
      g. Aqua Mix; Sealers Choice Gold.

2.06 ACCESSORY MATERIALS

A. Premium Latex Based Waterproofing and Crack Isolation Membrane; fast setting, flexible, thin, load-bearing, waterproofing membrane system consisting of a premixed, quick-drying liquid latex, complying with ANSI A118.10 and ANSI A118.12; and having IAMPO certification as a shower pan liner.
   1. Products:
      a. MAPEI, "AquaDefense".
      b. Custom Building Products; Red Gard.

B. Premixed, liquid-rubber, quick-drying crack-isolation membrane for installation under ceramic tile or stone complying with ANSI A118.12;
   1. Products:
      a. MAPEI, “Mapelastic CI”.
      b. Custom Building Products; Fracture Free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler.

3.03 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with The Tile Council of North America Handbook Method F125-Full, with Latex/Polymer Modified Portland Cement Mortar and Polymer Modified Tile grout, unless otherwise indicated.

1. Use uncoupling membrane if tiling over “Green Concrete” under tile in accordance with TCNA 128-16 unless other underlayment is indicated.

2. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122 and F122A, with latex-Portland cement grout.

a. Locations: Showers, tiled custodial closets and toilet rooms with floor drains

3.05 INSTALLATION - FLOORS –SELF LEVELING

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F205A , unless otherwise indicated.

B. Waterproofing Membrane: Install as recommended by manufacturer and as specified in the section in which the product is specified.

3.06 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244C, using membrane at toilet rooms.

B. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.07 GROUTING

A. Follow grout manufacturer's recommendations as to grouting procedures and precautions.

B. Remove all grout haze, observing both tile and grout manufacturer's recommendations as to use of acid and chemical cleaners.

C. Rinse tile work thoroughly with clean water before and after chemical cleaners.

D. Polish surface of tile work with soft cloth.

3.08 PROTECTION, CLEANING AND GROUT SEALING

A. Do not permit traffic over finished floor surface for 4 days after installation.

B. Apply to clean, completed tile walls and floors a protective coat of neutral cleaner solution, 1 part cleaner to 1 part water.

C. Cover tile floors with heavy-duty, non-staining construction paper, masked in place.

D. Prior to final acceptance of tile work, remove paper and rinse protective coat of neutral cleaner from all the surfaces.

E. Clean tile and grout surfaces.

F. Apply grout sealant according to manufacturer's directions.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustical units.

B. Accessories

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Acoustical sealant.

B. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.

C. Section 23 37 00 - Air Outlets and Inlets: Air diffusion devices in ceiling.

D. Section 26 51 00 - Interior Lighting: Light fixtures in ceiling system.

E. Section 27 51 16 - Public Address Systems: Speakers in ceiling system.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2014.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components, acoustical units, and other related components.

C. Samples: Submit two samples 12 x 12 inch (305 x 305 mm) or of size illustrating material and finish of acoustical units.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and related work.

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.08 PROJECT CONDITIONS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Install acoustical units after interior wet work is dry.

1.09 EXTRA MATERIALS

A. Provide 1/2 of 1 percent of total acoustical unit area of each type of acoustical unit for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. USG: www.usg.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels Type 1: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
   1. Size: 24 by 24 inches (600 by 600 mm).
   2. Thickness: 3/4 inches (19 mm).
   3. Composition: Wet formed.
   4. NRC Range:.70 , determined as specified in ASTM E 1264.
   5. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E1264.
   6. Edge: Square.
   7. Surface Color: White.
   8. Suspension System: Exposed grid Type 1.
      USG - Radar ClimaPlus High NRC/CAC Item No. 22521
      a. CAC: 35 to 40.
   9. Products:
      a. USG - Radar ClimaPlus High NRC/CAC Item No. 22521.
      b. Armstrong Fine Fissured 1713.
      c. Substitutions: See Section 01 60 00 - Product Requirements.
   10. Location: Classrooms and Offices- typical, unless otherwise noted

C. Acoustical Panels Type 2: Painted mineral fiber, ASTM E 1264 Type 1 with the following characteristics:
   1. Size: 24 by 24 inches (600 by 600 mm).
   2. Thickness: 5/8 inches (15 mm).
   3. Composition: Wet formed.

4. NRC Range:.50 to.60, determined as specified in ASTM E1264.
5. Ceiling Attenuation Class (CAC): 38, determined as specified in ASTM E1264.
6. Edge: Square.
7. Surface Color: White.
8. Surface Pattern: fine texture.
9. Product:
   a. Armstrong Dune 1772.
   b. USG Olympia 4211.
10. Suspension System: Exposed grid Type 1 .
11. Location: Student corridors, other areas as noted.

D. Acoustical Panels Type 2A: Painted mineral fiber, ASTM E 1264 Type 1 with the following characteristics:
1. Size: 24 by 24 inches (600 by 600 mm).
2. Thickness: 3/4 inches (19 mm).
3. Composition: Wet formed.
4. NRC Range:.50 to.60, determined as specified in ASTM E1264.
5. Ceiling Attenuation Class (CAC): 33, determined as specified in ASTM E1264.
6. Edge: Square.
7. Surface Color: White.
8. Surface Pattern: coarse texture.
9. Product:
   a. Armstrong Armatuff 861.
   b. USG Rock Face ClimaPlus 56335.
10. Suspension System: Exposed grid Type 2 .
11. Location: Toilet Rooms, other areas as noted.

E. Acoustical Panels Type 3: Painted mineral fiber, ASTM E 1264 Type 1 with the following characteristics:
1. Size: 24 by 24 inches (600 by 600 mm).
2. Thickness: 7/8 inches (____ mm).
3. Composition: Wet formed.
4. NRC Range:.80 to.85, determined as specified in ASTM E1264.
5. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
6. Edge: Square.
7. Surface Color: White.
8. Surface Pattern: fine texture.
9. Product:
   a. Armstrong : Health Zone Ultima High NRC, Item No 1445
   b. USG: Mars ClimaPlus Healthcare, Item No. 86152
10. Suspension System: Exposed grid Type 2.
11. Location: Kitchen, culinary arts and as noted.

F. Acoustical Panels Type 4: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
1. Size: 24 x 24 inches (600 x 600 mm).
2. Thickness: 7/8 inches (____ mm).
3. Composition: Wet formed.
4. Light Reflectance:.85 percent, determined as specified in ASTM E1264.
5. NRC Range:.75 , determined as specified in ASTM E 1264.

6. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E1264.
7. Edge: SLT.
8. Surface Color: White.
9. Surface Pattern: fine texture.
10. Suspension System: Exposed grid Type 1.
11. Products:
    a. Armstrong : Cirrus High NRC, Item No 574
    b. USG - Eclipse High NRC, Propduct No. 563
12. Location: as shown.

2.03 SUSPENSION SYSTEM(S) AND PERIMETER TRIM

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Exposed Steel Suspension System Type 1: Formed galvanized steel, commercial quality cold rolled; intermediate-duty.
    1. Profile: Tee; 15/16 inch (24 mm) wide face.
    2. Construction: Double web.
    3. Finish: White painted.
    4. Product: Prelude XL by Armstrong; DX by USG

C. Exposed Steel Suspension System Type 2: Where this designation is indicated, provide acoustical panel ceiling suspension system complying with the following:
    1. Products:
        a. ZXLA; USG
        b. Prelude Plus; Armstrong
    2. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized-Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet hot-dip galvanized according to ASTM A 653/A 653M, G60 (Z180) coating designation, with pre-finished, 15/16-inch-(24-mm-) wide, aluminum caps on flanges; other characteristics as follows:
        a. Aluminum Cap Finish: Painted white.

D. Perimeter Trim:
    1. Products:
        a. Borders at Clouds: Armstrong Axiom Classic Trim, 5-13/16" (nominal 6") high, extruded aluminum, curved applications.
    2. Finish: as selected from manufacturer's standard range.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.
    1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Acoustical Insulation: Specified in Section 07 21 00.

D. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
    1. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834 and the following requirements:

a. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. Acoustical Sealant for Exposed and Concealed Joints:
      1) PL Acoustical Sealant; Chemrex, Inc., Contech Brands.
      2) AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
      3) SHEETROCK Acoustical Sealant; United States Gypsum Co.

E. Gasket For Perimeter Moldings: Closed cell rubber sponge tape.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected ceiling plans.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Install in bed of acoustical sealant or with continuous gasket.
   2. Use longest practical lengths.
   3. Miter corners.

K. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a

tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

L. Form expansion joints . Form to accommodate plus or minus 1 inch (25 mm) movement. Maintain visual closure.

M. Install light fixture boxes constructed of gypsum board or acoustical panel above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.

N. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.

O. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

P. Install special brake-metal shapes at window heads so that they are square and finished to provide a precise fit. Do not use exposed fasteners.

Q. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to longest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install units after above-ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

H. Where round obstructions, bullnose concrete block corners, and other similar conditions occur, provide preformed closures to match perimeter molding.

I. Lay acoustical insulation for a distance of 48 inches (1200 mm) either side of acoustical partitions.

J. Install hold-down clips on panels within 20 ft (6 m) of an exterior door, and the following locations:
   1. Locker Rooms
   2. Large Group Toilet Rooms

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 54 20
SPECIALTY CEILING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Perforated metal ceiling panels
2. Proprietary composite canopy material.
3. Acoustical backing.
4. Acoustical cloud assemblies.
5. Acoustical canopies.
6. Wood ceiling panels.
7. Suspension assemblies
8. Accessories; provide other necessary items including devices for attachment overhead construction, secondary members, splines, splices, connecting clips, wall connectors, wall angles, and other devices required for a complete installation.
9. Coordinate layout and installation of items penetrating or being installed in ceiling systems with responsible trades.

B. Related Sections:
1. Section 054000 - Cold-Formed metal Framing
2. Section 057000 - Decorative Metal Ceilings in Auditorium
3. Sections 092116 - Gypsum Board Assemblies
4. Sections 095100 - Acoustical Ceilings
5. Sections 099000 - Paintings and Coatings
6. Division 23 - Heating, Ventilating and Air Conditioning
7. Division 26 - Electrical

C. This Section covers the general requirements only for SpecialtyCeiling Systems as shown on the drawings. The supplying and installation of additional accessory feature and other items not specifically mentioned herein, but which are necessary to make a complete installation shall also be included or clarified accordingly.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. E 84 - “Standard Test Method for Surface Burning Characteristics of Building Materials”
2. E 488 - “Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements”
3. B 209 - “Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate”
4. C 423 - “Sound Absorption and Sound Absorption Coefficients by Reverberation Room Method”
5. E 580 - “Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint”
6. C 635 - “Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings”
7. C 636 - “Recommended Practice for Installation of Metal Ceiling Suspensions Systems for Acoustical and Lay-in Panels”
8. A 641 - “Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire”
9. A 653 - “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip process.

10. E 1264 - Classification for Acoustical Ceiling Products”
11. E 1477 - Standard Test Method for Luminous Reflectance factor of Acoustical Materials by use of Integrating-Sphere Reflectometers”
12. D 1044 - Practice for Abrasion Resistance
13. D 1002 - Practice for Adhesion Resistance

B. Architectural Woodworking Institute (AWI) and or WIC requirements shall be met for woodworking materials.

C. NEMA Standard 11-14-95 for Chemical Resistance

D. Local Building Code: IBC, current edition requirements

1.03 SUBMITTALS

A. Product Data: Manufacturers product data for each type of product specified in this section.

B. Product Certification: Manufacturer’s certifications that products comply with specified requirements and governing codes including product data, laboratory test reports and research reports showing compliance with specified standards.

C. Shop Drawings: Submit shop drawings for reflected ceiling plans (RCP’s), drawn to scale, and coordinating penetrations and ceiling mounted items. Show the following details:
1. Reflected ceiling plan including joint patterns & details.
2. Metal ceiling suspension system plan with appropriate components, suggested hanger locations & details.
3. Method of attaching suspension system hangers to building structure.
4. Ceiling-mounted items including: light fixtures, air outlets and inlets, speakers, sprinklers, and other interfaces.
5. Special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
6. Framing and support details for work supported by ceiling suspension system.
7. List of materials, dimensions, hanger fastenings and any special details.
8. Minimum drawing scale: 1/8” = 1’-0”.
9. Provide full scale drawings of perforation patterns. Provide minimum 1”=1’-0” scale layout for each panel type showing perforation layout and orientation as required.
10. Samples for Verification: Full-size units (or as specified below) of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics. Submit samples for each type specified.
    a. 12-inch square, (acoustical) metal pan units.
    b. 12-inch long samples of each exposed molding or trim.
    c. 12-inch long samples of each suspension component.

D. Qualification Data: For firms and persons specified in "Quality Assurance". Provide documents to demonstrate their capabilities and experience. Include lists of at least 5 completed projects with project names and addresses, names and addresses of Architects and employers, and other information specified.

1.04 QUALITY ASSURANCE

A. Installer
1. To certify a minimum 5 years experience installing similar systems and scope to those specified.
2. Provide list of at least 5 successful installations with similar products and scope. Include names and contact numbers of Architect and employer for reference.

B. Manufacturer
   1. To certify a minimum of 5 years experience manufacturing similar products to those specified.
   2. Provide support documentation including name and date of project completion. Include names and contact numbers of Architect and employers for reference.
   3. Manufacturer shall be single source and shall be the fabricator and supplier of appropriate major components.

C. Fire-Test-Response Characteristics: Provide acoustical metal pan ceilings that comply with one of the following requirements:
   1. Fire-response tests performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
   2. Surface-burning characteristics of acoustical metal pan ceilings comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.

D. Mock-Ups: Before releasing acoustical metal ceilings construct mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up to comply with the following minimum requirements, using materials indicated for completed work:
   1. Locate mock-ups in the location and of the size indicated or, if not indicated, as directed by the Architect. Minimum mock-up size to be 10’x 10’ unless otherwise specified.
   2. Notify Architect seven days in advance of the dates and times when mock-ups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Site Coordination Mock-up:
      a. For approval of assembly, sequence of installation, coordination of trades involved, including ceiling panel types and shapes.
      b. Sized large enough to include a minimum of 2 adjacent panels Demonstrating interface work of fire protection sprinklers, lighting, mechanical diffusers, anchoring method at steel structure; adjacent vertical wall; skylight and fascia, trim and accessories.
   5. Obtain Architect’s approval of mock-ups before starting construction of acoustical metal pan ceilings. Submit detailed, ACAD shop drawing illustrating extent and scope of mock-ups. Do not proceed without approval of these drawings.
   6. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
      a. When directed, demolish and remove mock-ups from project site
      b. Approved mock-ups in an undisturbed condition at the time of initial Acceptance may become part of the completed work, subject to Architect / Owner approval.

E. Pre-installation Conference: Conduct conference at Project site as directed by the project Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical metal ceiling units and suspension system components in original, unopened packages clearly labeled with the following information: name of manufacturing source and location; product type, description and quantity; clients name and shipping address.

B. Panel’s protective layer to be removed only after installation is complete to help prevent panel surface damage.

C. Store components in a fully enclosed space where they will be protected against physical damage from direct moisture, significant change in humidity, direct sunlight, significant change in temperature, surface contamination, and any other preventable cause.

D. Exercise care in handling components to prevent damage to the surfaces and edges and prevent distortion or other physical damage. Comply with prescribed stacking instructions to prevent damage to components

1.06 PROJECT CONDITIONS

A. Environmental Limitations
   1. Do not install acoustical metal pan ceilings until after spaces are enclosed and weather tight and after wet work and work above ceilings is complete and accepted by project Architect.
   2. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Allow materials to reach ambient temperature and humidity for a minimum of 48 hours prior to starting installation.
   3. Coordinate with other work supported by, adjacent to or penetrating through the ceiling system.

B. Do not install products in exterior space unless the system has been specifically designed and approved for exterior application.

1.07 WARRANTY

A. Provide specified manufacturers warranty against defects in workmanship, discoloration, or other defect considered undesirable by the Architect or Owner.

B. This warranty shall remain in effect for a minimum period of five (5) years from date of initial acceptance.

1.08 MAINTENANCE & EXTRA MATERIALS

A. Maintenance Instructions: Provide manufacturers standard maintenance and cleaning instructions for finishes provided.

B. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Only typical system components are included with attic stock.
   1. Acoustical Metal Ceiling Pan Units: Full-size units equal to 1½ percent of amount installed.
   2. Ceiling Suspension System Components: Quantity of each grid and exposed component equal to 1½ percent of amount installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Armstrong World Industries, Inc. - P.O. Box 3001, Lancaster PA 17604. 717.397.0611 - www.armstrongceilings.com.

B. Ceilings Plus - 6711 E. Washington Blvd., Los Angeles, CA 90040. 800-822-3411 - www.ceilingsplus.com.

C. Gordon, Inc. - 5023 Hazel Jones Road, Bossier City, LA 71111, (800) 747-8954; www.gordon-inc.com.

D. Supply specified item. Specified manufacturer's standard of quality and manufacturing tolerances shall be the criteria for evaluating "equivalent" products.
   1. Substitutions: See Section 016000.

2.02 MATERIALS

A. Metal panels are to be manufactured from single sheets of aluminum selected for surface flatness, smoothness and freedom from surface blemishes where exposed to view in a finished unit. Do not use material where the exposed surface exhibit pitting, seam marks, roller marks, stains, discolorations, or variations in flatness exceeding those permitted by referenced standards for stretcher-leveled aluminum alloy sheets.

B. Metal panel material shall be primed aluminum sheet type 3105 series alloy that has a minimum 70% recycled content. It shall be machine stretcher-leveled and a minimum of .032" thickness, or greater if required, so that the panel deflection does not exceed L/360.

C. Individual linear panels shall be factory attached to torsion spring backer supports (cassette assemblies). Each panel (cassette) assembly shall have minimum of three backer supports for lengths greater than 60", creating a modular panel assembly with minimum ¼" reveals between panel ends.

D. No fasteners of any kind shall be visible on exposed face surfaces of ceiling panels or support tees. Down-light openings, sprinkler holes and miscellaneous penetrations shall be precision factory cut as required.

E. Sound-Absorptive Fabric Layer: Where specified, provide manufacturer's acoustic pads sized to fit cavity of linear members and modular panels. Material shall be both non-flammable and sound-absorptive.
   1. Fire Class shall be Class A, with surface-burning characteristics for flame-spread rating of 25 or less and smoke developed rating of 50 or less.. Provide independent accredited lab test results showing compliance with Class A rating as per ASTM E 84.
   2. Achieve absorption value of not less than .70- .80 NRC. Provide independent accredited laboratory test results illustrating compliance with acoustical requirements as per ASTM C 423.
   3. Provide fiberglass absorptive backing panels in sufficient thickness to achieve NRC rating specified.
   4. Acoustical metal panel ceilings to provide recycled "Soundtex" fiber fleece.
   5. Permanently laminate fleece and install acoustical pads to fit the ceiling system.

F. The plenum shall be 100% accessible. Every panel must be removable. Progressive panel access is not acceptable. Heavy duty torsion springs and steel clip assemblies to be mounted to every panel for downward access, without potential for damage to panel face or hinge assembly. Hinge assembly shall be mounted to every panel with minimum two flush to face, counter sunk chamfered fasteners. Attaching torsion spring directly to panel with fastener will not be acceptable.

G. Fire Tests: Complete system test including suspension, primed aluminum and finish shall meet ASTM E 84 Class A.

H. Provide and install matching finish trim on each side of each suspended area.

2.03 SPECIALTY CEILING SYSTEMS

A. TYPE EC: Expanded metal ceiling panels
   1. Location: Auditorium
   2. See Section 057000- Decorative Metal.

B. TYPE PC: Perforated metal ceiling panels
   1. Location: PAC Lobby
   2. Products:
      a. Basis of Design: Gordon, Inc.
   3. Panels shall be minimum 0.063" thick aluminum, in custom module sizes as shown on Architectural Drawings. Maximum panel width shall be 4'-6". Panels have minimum 1" up-turned edges.
      a. Multiple panels may be attached to each other with Stainless Steel Fasteners to make custom module sizes.
   4. Panels shall be perforated with a manufacturer's standard perforation pattern:
      a. Pattern: 0.5 inch square openings, 0.59 inches on center.
      b. Border: 1.5 inches, plus 1" up-turned leg.
   5. Finish:
      a. Powder coat finish selected from manufacturer's full color range.
   6. Accessories:
      a. Aircraft Cable suspension wires.
      b. Adjustable suspension fittings: Griplock Systems; www.griplocksystems.com.

C. TYPE WCP: Curved fire-retardant particle board ceiling panels with acoustical backing.
   1. Location: PAC Lobby
   2. Products:
      a. Basis of design: Armstrong Woodworks Canopies Item No. 5921, unperforated.
   3. Material: fire retardant particle board with face-cut veneers.
      a. Surface finish: Clear or tinted semigloss coating
      b. Veneer: as selected from manufacturer's full range.
   4. Panel size: as shown.
      a. Thickness: 3/4 inches.
      b. Join adjacent panels to form monolithic assembly with hairline joints.
   5. Suspension system: aircraft cable and hardware.
   6. ASTM E1264 Classification: Composite – Fire Class A
   7. Fire Performance: ASTM E84 surface burning characteristics: Flame Spread Index 25 or less; Smoke Developed Index 50 or less.

D. Ceiling Type 5:
   1. Manufacturer and Product: Armstrong World Industries, Inc., Metalworks Linear', No 5492; www.armstrongceilings.com.
      a. Substitutions: See Section 016000.
   2. Perforated linear metal ceiling:
      a. Surface Texture: Smooth
      b. Composition: Metal, with acoustical fleece backing.
      c. Color: Effects Cherry
      d. Sizes: 4 in x 96 in; 6 in x 96 in
      e. Edge Profile: Square with extended flange
      f. Perforation Option: Round - Diagonal
      g. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton 0.70
      h. Flame Spread: ASTM E 1264; Class A (FM).
   3. Aluminum Custom Trim - Extruded (Media Center)

a. Product/Manufacturer: Axiom Trim Channel: 6 in Axiom Vector Straight, Armstrong World Industries, Inc.
b. Commercial quality extruded aluminum alloy 6063 trim channel, factory finished in baked polyester paint. Commercial quality galvanized steel unfinished T-bar connection clips; galvanized steel splice plates.
   1) Color: Wood looks, match linear metal ceiling
   2) Size: 120 in X 6 in

2.04 METAL SUSPENSION SYSTEMS. GENERAL

A. Metal Suspension Standard: Provide panel manufacturer's metal suspension systems of types, structural classifications, materials, and finishes indicated that comply with applicable ASTM C 635 requirements.
   1. Main and cross runners to be Standard “Heavy Duty” tee bar (as per ASTM C 635).
   2. Face of main and cross runners to be factory finished matte black unless known otherwise.
   3. Face of main runners to be factory slotted to receive torsion springs
   4. Provide suspension system made from steel sheet with an average recycled content such that post consumer recycled content plus one half or pre consumer content is not less than 25 percent.

B. Suspension Systems: Provide complete suspensions systems with main runners, cross runners, hangers, trim molding, seismic retention clips, load resisting struts and other suspension components required to support ceiling and other ceiling supported construction.

C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, “Direct-Hung”, unless otherwise indicated.
   1. “Direct-Hung” Suspensions Systems: System composed of main runners supported by hangers attached directly to building structure.

D. Hangers: Type and metal standard with ceiling system manufacturer, sized to comply with structural classification indicated.
   1. Wire Hangers, where applicable, Braces, and Ties: Provide wires complying with the following requirements:
      a. Zinc-Coated Carbon-Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
      b. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 2mm diameter wire.
      c. Extruded Aluminum members shall comply with ASTM B209.
   2. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
   3. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
   4. Angle Hangers: Angles with legs not less than 22mm wide, formed with 1mm thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation, with bolted connections.

PART 3- EXECUTION

3.01 EXAMINATION

A. Examine substrates and structural framing to which acoustical metal panels attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect installation and anchorage, and other conditions affecting performance of metal panel ceilings.

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

3.02 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Measure each ceiling area and establish layout of acoustical metal pan units to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.

C. Survey substrate for wall attachment to assure squareness and proper elevation for wall panel installation.

3.03 INSTALLATION

A. General: Install acoustical metal pan ceilings, per manufacturers shop drawings provided, per manufacturer's written instructions and to comply with publications referenced below.
   1. ClSCA "Ceiling Systems Handbook.
   2. Standard for Ceiling Suspension System Installations - ASTM C 636.
   3. Standard for Ceiling Suspension Systems Requiring Seismic Restraint - ASTM E 580
   4. IBC (International Building Code) standard for Seismic Zone for local area.

B. Suspend ceiling hangers from building's approved structural substrates and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produce hanger spacings that interfere with location of hangers at spacing 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 and publications.

C. Where used secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

D. Space hangers not more than 48 inches on center, along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches from ends of each member. Supply supporting calculations from licensed Structural Engineer verifying hanger spacing meets all requirements, when spacing exceed those recommended.

E. Fine level grid to 1/8 inch in 10 feet from specified elevation(s), square and true.

F. Adjust suspension system runners so they are square (within .5 degree from 90 degrees) and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

G. Secure bracing wires to ceiling suspension members and to supports acceptable to Architect / Engineer and or inspector. Suspend bracing from building's structural members and / or structural deck, as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs(unless directed otherwise).

H. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical metal pan. Method of edge trim attachment and design of edge trims to be approved by Architect

1. Screw attach moldings to substrate at intervals not more than 18” O.C. and not more than 6” from ends, leveling with ceding suspension system to a tolerance of 1/8” in 10’. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim without prior written approval.

I. Scribe and cut acoustical metal panel units for accurate fit at penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.

J. Install acoustical metal panel units in coordination with suspension system.
1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions, unless otherwise indicated. Install directionally patterned or textured panels in directions indicated on approved shop drawings. Panel-joints shall flow smoothly and in a straight line within 1/8” in 10’. Intersections shall be continuous.
2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
3. Remove protective film from panels only when space is completely clean and free of airborne particles. Use white cotton gloves for final installation of panels into grid system.

3.04 ADJUSTING AND CLEANING

A. Adjust ceiling components to provide a consistent finish and appearance in conformity with established tolerances and requirements.

B. Clean exposed surfaces of acoustical metal panel ceilings and walls. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient tile flooring.

C. Luxury Vinyl Tile

D. Resilient base.

E. Resilient stair accessories.

F. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

B. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2015.

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).

E. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing; 2004 (Reapproved 2014).

F. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.04 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Shop Drawings: Indicate seaming plans and floor patterns.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: Submit two samples, 6 by 6 inch (___ by ___ mm) in size illustrating color and pattern for each resilient flooring product specified.

E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Flooring Material: 100 square feet (_____ square meters) of each type and color.
   2. Extra Wall Base: 50 linear feet (_____ linear meters) of each type and color.
   3. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.06 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 SHEET FLOORING

A. Vinyl Sheet Flooring - Type SV-1, SV-2: Homogeneous without backing, with color and pattern throughout full thickness.
   1. Manufacturers:
      a. Armstrong, Medintech/Medintone .
   2. Minimum Requirements: Comply with ASTM F1913.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   4. Thickness: 0.080 inch (2.0 mm) nominal.
   5. Sheet Width: 79 inch (____ mm) minimum.
   6. Seams: Heat welded.
   7. Color: As indicated on drawings.

B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.02 TILE FLOORING

A. Vinyl Enhanced Tile: Types RT-1, RT-2, RT-3, RT-4, RT-5, RT-6. RT-7:
   1. Product: Color Essence by Johnsonite
   2. Complies with requirements for ASTM F 1066, Class 3 (Surface Pattern) Standard Specification for Vinyl Composition Floor Tile
   3. Wear layer/Overall thickness: 1/8" (3.2 mm)
   4. Tile size: 12" x 12" (30.5 x 30.5 cm)
   5. Slip Resistance: ADA Compliant
   6. Polyurethane Reinforced wear surface with Tritonite Finish
   7. ASTM F 970, Standard Test Method for Static Load Limit - 400 PSI (modified for higher load)
   8. ASTM E 648, Standard Test method for Critical Radiant Flux of 0.45 watts/cm2 or greater, Class I
   9. Warranty: 10 year Manufacturer's Warranty
   10. Vinyl Enhanced Tiles contain 23% pre-consumer and 6% post-consumer recycled content
   11. Phthalate-free
   12. 100% Recyclable

B. Luxury Vinyl Tile (LVT-1): Printed film type, with transparent or translucent wear layer.
   1. Manufacturers:
      a. Armstrong; Product: Natural Creations Classic.
      b. Subject to compliance with requirements, other acceptable manufacturers are:
         1) Mohawk
         2) Toli
      c. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   4. Plank Tile Size: 4 by 36 inch (102 by 914 mm).
   5. Wear Layer Thickness: 0.020 inch (0.50 mm).
   6. Total Thickness: 0.125 inch (3 mm).
   7. Color: As indicated on drawings.

C. Rubber Tile (RTF-1): Type I- Homogeneous, color and pattern throughout thickness;
   1. Manufacturers:
      a. Burke Flooring; Endura Line: www.burkeflooring.com/#sle.
      b. Johnsonite, a Tarkett Company; Minerality Resilient Rubber Floor Tiles: www.johnsonite.com.
      c. Roppe Corp: www.roppe.com..
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   4. Size: 24 by 24 inch (___ by ___ mm).
   5. Total Thickness: 0.125 inch (3.2 mm).
   6. Texture: match stair treads.
   7. Color: as selected.
   8. Location: Use for stair landings.

2.03 STAIR COVERING

A. Stair Treads (RST-1): Rubber; full width and depth of stair tread in one piece; tapered thickness.
   1. Manufacturers:
      a. Burke Flooring: www.burkeflooring.com.
      b. Johnsonite, a Tarkett Company: www.johnsonite.com.
      c. Roppe Corp: www.roppe.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   4. Thickness: 0.210 inches, tapering to 0.113 inches.
   5. Nosing: Square.
   6. Striping: 2 inch (24 mm) wide contrasting color rubber strips.

7. Pattern: Johnsonite "Bamboo" surface texture, or equivalent texture from other listed manufacturers..
8. Color: as selected.

B. Stair Risers (RR-1): Full height and width of tread in one piece, matching treads in material and color.
1. Manufacturers:
a. Burke Flooring: www.burkeflooring.com.
b. Johnsonite, a Tarkett Company: www.johnsonite.com.
c. Roppe Corp: www.roppe.com.
2. Thickness: 0.125 inch (3.2 mm).

C. Rubber Nosing (RN-1)
1. Manufacturers:
a. Burke Flooring: www.burkeflooring.com.
b. Johnsonite, a Tarkett Company: www.johnsonite.com.
c. Roppe Corp: www.roppe.com.

2.04 RESILIENT BASE

A. Resilient Base Type RB-1, RB-2, RB-3, RB-4: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
1. Manufacturers:
a. Johnsonite, a Tarkett Company: www.johnsonite.com.
b. Substitutions: See Section 01 60 00 - Product Requirements.
2. Height: 4 inch (100 mm) (typical, unless otherwise noted).
3. Thickness: 0.125 inch (3.2 mm).
4. Finish: Satin.
5. Color: As indicated on drawings.

B. Millwork Rubber Base, Type MRB-1, MRB-2, MRB-3, MRB-4:
1. ASTM F-1861 Standard Specification for Resilient Wall Base, Type TP, and Group 1.
2. Manufacturer and Product: Johnsonite Reveal.
a. Substitutions: See Section 01 6000 - Product Requirements.
3. Configuration: 1/4" (6.35mm) thick by 6" (152 mm) height with a 45° angular top and a 7/32” (5.5mm) wide surface reveal

2.05 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Moldings, Transition and Edge Strips: Same material as flooring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Test in accordance with Section 09 05 61.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

I. Install flooring in recessed floor access covers and expansion joint covers, maintaining floor pattern.

J. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.04 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

B. Cut sheet at seams in accordance with manufacturer's instructions.

C. Seal seams by heat welding where indicated.

3.05 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install plank tile with a random offset of at least 6 inches (152 mm) from adjacent rows.

3.06 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter or scribe internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.07 INSTALLATION - STAIR COVERINGS

A. Adhere over entire surface. Fit accurately and securely.

3.08 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 09 66 23
EPOXY-RESIN TERRAZZO FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes.
   1. Thin-set epoxy terrazzo.
   2. Precast, thin-set, epoxy terrazzo wall base units.
   3. Related accessories.
   4. Refinishing existing terrazzo floors.

1.02 RELATED REQUIREMENTS:

A. Section 01 74 19 – Construction Waste Management.

B. Section 01 81 13 – Sustainable Design Requirements.

C. Section 01 81 14 – Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints & Coatings.

D. Section 01 81 19 – Indoor Air Quality Requirements.

E. Section 03 30 00, Cast In Place Concrete.

F. Section 07 26 16, Under-slab Vapor Retarder/Barrier.

G. Section 07 90 00, Joint Protection.

1.03 REFERENCES

A. American Concrete Institute (ACI):
   1. ACI Committee No. 403 Bulletin Title No. 59-43.

B. American Society for Testing and Materials (ASTM):
   1. ASTM C131 "Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine."
   2. ASTM C1021 Standard Practice for Laboratories Engaged in the Testing of Building Sealants."
   3. ASTM C1093 Standard Practice for Accreditation of Testing Agencies for Masonry."
   4. ASTM D412 "Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension."
   5. ASTM D696 "Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer."
   6. ASTM D1308 "Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes."
   7. ASTM D2240 "Standard Test Method for Rubber Property-Durometer Hardness."
   8. ASTM D2370 "Standard Test Method for Tensile Properties of Organic Coatings."
   9. ASTM E96 "Standard Test Methods for Water Vapor Transmission of Materials."
   10. ASTM F1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride."
   11. ASTM F2170 "Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.".

C. The International Accreditation Service (IAS)
   1. IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC Standard 17025.

D. International Concrete Repair Institute (ICRI):

1. "Technical Guidelines 03732: Guide for Selecting and Specifying Surface Preparation for Sealers, Coatings, and Membranes."

E. The International Laboratory Accreditation Cooperation (ILAC).
1. IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC Standard 17025.

F. International Masonry Institute (IMI).

G. International Organization for Standardization (ISO):
1. ISO 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

H. The National Terrazzo & Mosaic Association Inc. (NTMA):
1. “Terrazzo Specifications and Design Guide”
2. “Guide Specification for Epoxy Terrazzo”.
3. Technical Bulletin #111.

1.04 LEED REQUIREMENTS:

A. LEED Focus Materials (LFMs) For This Section:
1. Targeted products containing Recycled Content (MRc4)
2. Targeted products containing Regional Material (MRc5)
3. Targeted products to meet Low Emitting Flooring requirements (EQc4.3)

1.05 COORDINATION

A. Coordinate the types of traffic allowed on terrazzo between the following events:
1. Completion of pouring and before coarse grinding.
2. Completion of grouting and before polishing.

B. Coordinate the preparation for terrazzo work with the installation of plumbing, electrical, communications, and data work in the floor area to receive terrazzo.
1. Verify that fixtures, equipment, and outlets will be located properly and at the correct elevation.

1.06 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Prior to installation of concrete substrates, conduct conference at Project site to comply with requirements in Division 1. Review methods and procedures related to terrazzo including, but not limited to, the following:
1. Inspect and discuss installation procedures, joint details, jobsite conditions, substrate specification, vapor barrier details and coordination with other trades.
2. Review and finalize construction schedule and verify availability of materials, Installer’s personnel, equipment and facilities needed to make progress and avoid delays.
3. Review special terrazzo designs and patterns.
4. Review dust control procedures.
5. Review plans for concrete curing and site drying to enable timely achievement of suitable slab moisture conditions.
6. Review concrete substrate tolerance requirements for acceptable terrazzo installation.

1.07 SUBMITTALS

A. Product Data: Manufacturer’s product data for each type of terrazzo and accessory including the following information:
1. Physical properties.
2. Performance properties.
3. Independent Lab Testing for Moisture Mitigation System and Bond Strength Testing

4. For tests not listed in published data, supply missing data according to standard referenced.

B. Refinishing Terrazzo Floors:
1. Product Data: Provide data for sealer and cleaner and grout.
2. Cleaning and Maintenance Data.

C. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details and attachments to other work. Show layout of the following:
1. Divider strips.
2. Control- and expansion-joint strips.
3. Base and border strips.
4. Precast terrazzo-jointing and edge configurations including anchorage details.
5. Terrazzo patterns.
6. Layout of special graphic patterns.
7. Large scale details of terrazzo patterns and metal or other material inserts.

D. Samples for Initial Selection: Provide Manufacturer's color plates showing the full range of colors and patterns available for each terrazzo type indicated.

E. Samples for Verification: For each type, material, color and pattern of terrazzo and accessory required showing the full range of color, texture and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes and proportions. Prepare samples of same thickness and from same material to be used for the Work in size indicated below:
1. Epoxy Terrazzo: minimum 6" x 6" (150 mm x 150 mm) sample of each color and type of terrazzo.
2. Precast Epoxy Terrazzo: minimum 6" x 6" (150 mm x 150 mm) sample of each color and type of terrazzo.
3. Accessories: 6" (150 mm) length of each kind of divider strip, stop strip and control joint strip required.

F. Qualification Data: For Installer and Manufacturer.

G. Material Test Reports: For moisture and/or relative humidity of substrate, by a qualified testing agency.

H. Preconstruction Examination Reports: For list conditions of in place substrate which will detrimental to performance of terrazzo flooring installation.

I. Sample Warranties: For manufacturer's special warranties.

J. LEED Product and Material Data Summary Form: For all installed products and materials of this Section, complete the "LEED Product and Material Data Summary Form" (attached to end of Section 01 81 13 - Sustainable Design Requirements)
1. Product Material Cost: Provide the cost for material, or an assembled product, including taxes and delivery but excluding any cost for labor and equipment required for installation after the material is delivered to the site.
2. Product Data for Credit MRc4, Recycled Content: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Data for Credit MRc5, Regional Material: For products having regional materials, documentation indicating location of raw material extraction, harvest or recovery, as well as, manufacture (location of final assembly) within 500 miles of project

site. Include statement indicating cost for each material or component of the assembled product.

4. Product Data for Credit EQc4.3, Flooring: Certificates from product manufacturer or testing agency for flooring products indicating that they comply with the applicable standards.

1.08 CLOSEOUT SUBMITTALS

A. Maintenance Data: NTMA maintenance recommendations and manufacturer's instructions to include in maintenance manuals.

B. Repair Procedures: Provide written procedures for the following:
   1. Epoxy Terrazzo Flooring: Removal and replacing damaged portions of flooring.

1.09 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage a terrazzo manufacturer with minimum 5 years documented manufacturing experience producing epoxy binder, and flexible crack isolation membranes; including the following:
   1. Proof of NTMA membership.
   2. Furnish documentation for at least 5 epoxy terrazzo projects of the same scope and complexity; installed in the past 5 years using material being submitted for this project.
   3. For each epoxy terrazzo project submitted, provide the following information:
      a. Project name.
      b. Square footage of terrazzo installed.
      c. Lineal footage of precast base and cast in place base.
      d. Address of facility with contact name and phone number.
      e. Contact name, address and phone number of prime contractor or construction manager.
      f. Field experience resumes of key project personnel including lead supervisor and field technicians to be used on this project.

B. Installer Qualifications: Submit proof of Contractor's membership in NTMA or IMI with a letter recognizing that they are a qualified installer in good standing and is acceptable to epoxy terrazzo manufacturer.
   1. Furnish documentation for at least 3 epoxy terrazzo projects of the same scope and complexity; installed in the past 5 years using material being submitted for this project.

C. PATCHING HOLES IN TERRAZZO: If patching the existing terrazzo floor is necessary a sample should be made to match the exiting floor and a submittal sample sent to the architect prior to installation for approval. The manufacture materials used in the patch should be approved by NTMA and installed according to their standards. (For example, Master Terrazzo Morricite System)
   1. The area needing a patched should be clean and free of all foreign materials.
   2. Select matching aggregates and epoxy for color that matches existing terrazzo.
   3. Install patch materials according to NTMA guidelines
   4. Installer shall be a contractor member of NTMA and shall perform all work in accordance with NTMA standards

D. Testing Agency Qualifications: Qualified according to ASTM C1021 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC Standard 17025.

E. Mockups: Build mockups to verify selections made under sample submittals; to demonstrate aesthetic effects; and to set quality standards for materials and execution.

1. Build mockup of typical terrazzo flooring installation as shown on Drawings.
   a. Size: Minimum 100 sq. ft. (9 sq. m.) of typical poured-in-place flooring and base condition for each color and pattern in locations directed by Architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Sustainability and LEED Standards Certification:
1. Regional manufactured products with percentage by weight.
2. Recycled content calculated as 1/2 preconsumer + postconsumer.
3. VOC content limitations defined in Section 018114, "Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, and Coatings."
4. Low Emitting Flooring certification.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's undamaged, unopened containers with a label on each container clearly marked with the following information:
1. Product name
2. Manufacturer's name
3. Component designation (A or B, etc.)
4. Ratio of component mixture
5. CHEMTREC Emergency Response Information

B. Handle materials by methods which prevent damage.

C. Inspect direct jobsite deliveries to assure quantities are correct; materials comply with requirements; and materials are not damaged.

D. Immediately return materials found to be defective in manufacturing and materials damaged in transit, handling or storage.
1. Replace defective materials at no cost to Owner.

E. Store materials per manufacturer's instructions and as follows:
1. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity.
2. Maintain storage temperatures between 60° F (15.6° C) and 90° F (32.2° C).
3. Maintain seals and labels intact and legible.
4. Do not use materials which have been stored for a longer period of time than the manufacturer's maximum recommended shelf life.

1.11 FIELD CONDITIONS

A. Temperature:
1. Maintain the ambient room and substrate temperature at 55° F (12.8° C) or above during stripping and pouring.
   a. Maintain this temperature at least 48 hours after completion of pouring.
2. After terrazzo has been poured, maintain substrate temperature at 40° F (4.4° C) or above until substantial completion.
3. Each day of installation, before beginning work, verify that the dew point is at least 5° F (-15.0° C) less than the slab and air temperature.

B. Verify that adequate ventilation is provided.

C. Maintain a minimum uniform level of 50-60 foot candles (538.2 Lux - 645.8 Lux) in areas where terrazzo system is being installed.

D. Field Measurements, Precast Terrazzo: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.

E. Acceptable Substrate Conditions:
   1. Flatness Tolerance: Maximum variation from flatness of 1/4 inch in 10 feet (6 mm in 3 m).
   2. Concrete floor Finish: Steel trowel finish.
   3. Allow concrete to receive epoxy terrazzo to cure for at least 30 days before beginning installation process.
      a. Allow no curing agents to be used in areas to receive terrazzo.
   4. Test concrete substrate to determine acceptable moisture levels prior to terrazzo installation.

F. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

G. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.

H. Provide protection from other trades prior to final acceptance by owner.

I. Dust Control: Control and collect dust produced by grinding operations.

1.12 WARRANTY

A. Special Warranty: Manufacturer and installer, jointly, agree to provide labor and material to repair (and if necessary to replace) components of epoxy terrazzo flooring system that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, loss of bond and damage due to normal wear and tear.
   2. Failures do not include the following:
      a. Damage due to bubbling or loss of adhesion due to moisture penetration through the substrate.
      b. Acts of God or other elements beyond scope of protection of this system.
      c. Reflective cracks from substrate.
   3. Warranty Period: One year(s) from date of Substantial Completion.
   4. Limitations:
      a. In case of warranty claim, Owner will provide written notice to terrazzo manufacturer and installer within 30 days of problem's discovery.
      b. Owner will provide free access to area during normal working hours.
      c. Owner assumes responsibility for protection and maintenance of epoxy terrazzo flooring from date of Substantial Completion on.
      d. Remedies provided by epoxy terrazzo flooring manufacturer and installer are limited to direct repair of Epoxy Terrazzo Flooring System.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products by Master Terrazzo Technologies, Levittown, PA (www.masterterrazzo.com) indicated in Part 2 Articles below or comparable products by one of the following:
   1. Crossfield Dex-O-Tex.

2. General Polymers (a subsidiary of Sherwin Williams).

B. Source Limitations: Obtain primary Epoxy Terrazzo Flooring System materials including membranes, primers, resins, and hardening agents from a single manufacturer.
   1. Obtain aggregates, solvents, divider strips, sealers and cleaners from source recommended by primary materials manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

2.03 EPOXY TERRAZZO FLOORING SYSTEM

A. Materials:
   1. Epoxy Resin: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
      a. Physical Properties without Aggregates:
         1) Hardness: ASTM D2240 70-85 Shore D
         2) Minimum Tensile Strength: 4,800 psi (33 mPA) per ASTM D638 for a 2-inch (50 mm) specimen made using a "C" die per ASTM D412.
         3) Minimum Compressive Strength: 12,000 psi (83 mPA) per ASTM D695, Specimen B cylinder.
         4) Chemical Resistance: No deleterious effects by contaminants listed below after 7-day immersion at room temperature per ASTM D1308.
            (a) Distilled water
            (b) Mineral water
            (c) Isopropanol
            (d) Ethanol
            (e) 0.025 percent detergent solution
            (f) 1 percent soap solution
            (g) 10 percent sodium hydroxide
            (h) 10 percent hydrochloric acid
            (i) 5 percent acetic acid
      b. Physical Properties with Aggregates: For resin blended with Georgia White marble, ground, grouted, and cured per requirements in NTMA's "Guide Specification for Epoxy Terrazzo," comply with the following:
         1) Flammability: Self-extinguishing, maximum extent of burning 0.25 inch (6 mm) per ASTM D635.
         2) Linear Coefficient of Thermal Expansion: 25.0x10-6 in/in per ºF (11.4x10-7 cm/cm per ºC) for temperature range of -12° to 140° F (-24° to 60° C) per ASTM D696.
         3) Bond Strength: When tested in accordance with Field Test Method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin Title No. 59-43 the Epoxy terrazzo shall comply with the following value: 100 percent concrete failure minimum, with 300 psi (2.1 mPA) minimum tensile strength.
   2. Aggregate Chips: Marble, Granite, Glass, Synthetic, and Mother of Pearl:
      a. Sizes: #2's, #1's and #0's, conforming to NTMA gradation standards.
      b. Abrasion and Impact Resistance: ASTM C131-89; maximum 40 percent loss.
      c. Chips shall contain no deleterious or foreign matter.

B. Mix: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
   1. Color and Pattern Schedule: Where the following designations are indicated, provide specified terrazzo matrices matching architect's samples.
   2. Recycled glass not to exceed 20% of the mix.
   3. Allow for minimum two mix types without additional cost to owner.

2.04 DIVIDER AND ACCESSORY STRIPS

A. Thin -Set Divider Strips: L-type and T-type.
   1. Material: White zinc alloy, .
   2. Top Width: 1/16 inch (1.6 mm) and 1/8 inch (3 mm).

B. Heavy-Top Divider Strips: Angle type in depth required for topping thickness indicated.
   1. Bottom-Section Material: Matching top-section material.
   2. Top-Section Material: White zinc alloy, unless otherwise indicated.
   3. Top-Section Width: 1/8 inch (3 mm), unless otherwise indicated.

C. Control joint Strips: Separate, double L-type divider strips, positioned back to back with 3/8 inch (9.5 mm) separation filled will sealant.

D. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Provide the following types of accessory strips:
   1. Base bead and base dividers.

2.05 MISCELLANEOUS PRODUCTS

A. Concrete Patch and Topping: 100 percent solids fill mortar system including blended aggregate.
   1. Basis of Design Product: MorriFill™ Epoxy Slope and Fill Mortar.
   2. Compressive Strength: ASTM C579, 8,000 psi (55 mPA) minimum.
   3. Hardness: ASTM D2240, 75-80 Shore D

B. Moisture Remediation System: Two-component formulation designed to reduce moisture vapor transmission through concrete and provide bond with epoxy terrazzo flooring system.
   1. Basis of Design: Morricite MVP™ Moisture Suppression System by Master Terrazzo Technologies.
   2. Adhesion: ASTM D4541, 500 psi (3.5 mPA).
   3. Moisture Vapor Transmission: ASTM E96, 0.131 perm.

C. Primer: 100 percent solids, epoxy primer moisture insensitive. No solvent containing primers are allowed
   1. Basis of Design Product: Morricite® Primer.
   2. Moisture Vapor Transmission: ASTM E96, 1 perm maximum.

D. Crack Isolation Membrane
   1. Basis of Design Product: MasterFlex™ Flexible Epoxy Membrane.
   2. Flexible Epoxy Membrane: Flexible epoxy membrane with 100 percent solids with the following properties:
      a. Tensile Strength: ASTM D2370 at 68° F (20° C) 1,500 psi (10 mPA).
      b. Elongation: ASTM D2370 at 68° F (20° C) 130 percent.
      c. Adhesion: ASTM D4541, 350 psi (2.4 mPA)

E. Membrane Reinforcing: Fiberglass mesh reinforcement fabric compatible with crack isolation membrane.
   1. Basis of Design Product: MasterFlex™ Fabric.

F. Divider-Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use and acceptable to terrazzo manufacturer.
   1. Use adhesive that has a VOC content of 50g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Anchoring Devices:
   1. Strips: Provide mechanical anchoring devices for strip materials as required for secure attachment to substrate.
   2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by Terrazzo Contractor for proper anchorage and support of units for conditions of installation and support.

H. Finishing Grout: Epoxy grout with 100 percent Solids.
   1. Basis of Design Product: Morricite® Terrazzo Grout.

I. Control Joint Filler: Flexible, grindable, epoxy joint filler, 100 percent solids, with the following properties:
   1. Basis of Design Product: MTT ColorFlex™.
   2. Tensile Strength: ASTM D2370 at 68° F (20° C) 1,600 psi (11 mPA)
   3. Elongation: ASTM D2370 at 68° F (20° C) 100 percent
   4. Tensile Modulus: ASTM D2370 at 68° F (20° C) 27,800 psi (192 mPA)
   5. Color: As selected by the Architect.

J. Joint Sealant: MTT ColorFlex™ flexible sealant.

K. Expansion Joints: Comply with requirements of Section 07 92 00 "Joint Sealants".

L. Terrazzo Cleaner: As recommended by cleaner manufacturer for use on terrazzo type specified and as follows:
   1. Biodegradable
   2. Chemically neutral
   3. pH factor between 7 and 10
   4. Free from phosphate, crystallizing salts, and water soluble alkaline salts.

M. Terrazzo Sealers: Slip- and stain-resistant impregnating sealer that meets standard coefficient of friction of 0.6 or higher, does not affect physical properties of terrazzo and complies with NTMA's "Terrazzo Specifications and Design Guide."
   1. General: Provide sealers approved by terrazzo flooring system manufacturer.

2.06 REFINISHING TERRAZZO FLOORS

A. Materials
   1. Cleaner: Potable water, free of iron
   2. Sealer: Penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components.
   3. If patching of floor is needed use Master Terrazzo Technologies Morricite System epoxy and materials.

B. Equipment
   1. All work shall be executed with conventional terrazzo grinding equipment according to trade practice. No lighter type machines, such as floor scrubbing machines, will be accepted.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and areas, with Terrazzo Contractor present, for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Evaluate slab condition, including slab moisture content and extent of repairs required to comply with substrate requirements of NTMA's "Terrazzo Specifications and Design Guide" and the requirements of this Section.
   2. Verify that concrete substrate was poured no fewer than 30 days prior to date of examinations.
   3. Verify existing work has no defects affect proper execution of terrazzo work.
   4. Verify that concrete substrate meets flatness tolerances.
   5. Verify that concrete substrates are visibly dry and free of moisture.

B. Prepare written preconstruction examination report, endorsed by Installer, listing conditions detrimental to performance.

C. Proceed with installation only after unsatisfactory conditions, including flatness tolerances, have been corrected.

D. Verify measurements and dimensions; coordinate the installation of insert and work of other trades.

3.02 PREINSTALLATION TESTING

A. Concrete Moisture Testing, General
   1. Conduct relative humidity test at each test site.
   2. Conduct one pH test at each test site.

B. Calcium Chloride Testing:
   1. Perform tests in accordance with ASTM F1869.

C. Relative Humidity Testing:
   1. Perform tests in accordance with ASTM F2170.
   2. Conduct relative humidity testing at the following depths:
      a. Basement Slabs and Slabs-On-Grade: Measure temperature and relative humidity at 40 percent of slab thickness measured from top surface.
      b. Elevated Slabs: Measure temperature and relative humidity at 20 percent of slab thickness measured from top surface.
   3. Drill test hole at each test site to accommodate test sleeve.
   4. Hole Diameter: In accordance with test equipment manufacturer's instructions.
   5. Drilling Fluids: Not permitted.
   6. Vacuum dust and debris from test hole.
   7. Insert sleeve, to the full depth of test hole. Cap or plug sleeve to prevent test hole contamination.
   8. Permit the test site to acclimate for minimum 72 hours before measuring relative humidity.
   9. Remove sleeve plug and insert probe to bottom of test hole. Allow test probe to reach temperature equilibration with concrete slab.
   10. Measure and record temperature and relative humidity at the test site.

D. Proceed with terrazzo installation only after substrates have a maximum relative humidity measurement reading less than 80 percent.

1. If concrete substrate moisture exceeds 80% according to ASTM F2170, consult terrazzo manufacturer for additional drying or negative side moisture remediation methods.
2. Provide manufacturer recommended negative side moisture remediation at all slabs on grade scheduled to receive epoxy terrazzo.

3.03 PREPARATION

A. Clean substrates of substances, including oil, grease and curing compounds, that might impair terrazzo bond. Provide clean, dry and neutral substrate for terrazzo application.

B. Provide clean, dry, and neutral substrate for terrazzo application.
   1. Determine dryness characteristics by performing moisture tests recommended by terrazzo manufacturer.

C. Concrete Slabs:
   1. Provide sound concrete surface free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil and other contaminants incompatible with epoxy terrazzo.
      a. Prepare concrete mechanically by shot blasting or by grinding.
         1) Surface preparation results should achieve a CSP3-CSP4 profile according to International Concrete Repair Institute Guideline No. 03732.
      b. Remove contaminating and bond breaking substances including but not limited to the following:
         1) Dust.
         2) Laitance.
         3) Curing compounds.
         4) Coatings.
         5) Sealers.
         6) Oil.
         7) Grease.
         8) Mastics.
         9) Adhesives.
      c. Chemically remove oil and grease not removed by vacuum blasting.
      d. Mechanically remove spalled and deteriorated concrete with scabbling or chipping hammers.
      e. Do not acid etch concrete.
      f. Repair or level damaged concrete with concrete patch and topping.
      g. Do not use latex fills and self-leveling underlayments.
      h. Cracks and non-expansion joints greater than 1/16 inch (1.6 mm) wide after surface preparation shall be prepared until sound.
         1) Repair cracks and non-expansion joints according to NTMA Technical Bulletin #111.

D. Protect other work from dust generated by shot blasting and grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.
   1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

E. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.

1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

F. Apply one coat of moisture remediation system over concrete surface prepared to receive epoxy-resin terrazzo flooring according to manufacturer's written instructions where indicated on drawings.

3.04 REFINISHING TERRAZZO FLOORS

A. General
1. Perform work in accordance with NTMA recommendations as posted on their website at www.ntma.com.

B. Preparation
1. Cover and protect all adjacent finished surfaces during restoration process.

C. Crack Repair
1. Clean cracks by mechanical means (like metal dental pick or fine “Dremel” tooling) to remove dirt, debris and sealers - "V" shape routing out or significant widening is not recommended..
2. Grout cracks to match existing matrix prior to initial grinding.

D. Initial Grinding
1. Terrazzo Contractor must access flooring condition prior to Grinding to determine the condition of the floor and determine steps of grinding. If the condition of the floor has years of sealer on the surface a heavy grind may be needed to remove old stains and sealers, etc. This will require using grinding diamond pad with 60-80 grit stone - all in the presence of water. If the floor is in good condition and has been maintained properly you may want to start with 150 to 200 grit diamond pads. (The final polish is achieved by grinding at 400 grit with diamond pads.)

E. Grouting
1. Cleanse floor with ample clean water and rinse.
2. Remove excess rinse water and machine or hand-apply grout, with color added to match the matrix of the terrazzo floor, taking care to fill voids. IF VOIDS ARE NOT FILLED REGROUT THE FLOOR AREA A SECOND TIME.

F. Curing Grout
1. The grout shall remain on the surface until fully cured, commonly a minimum of 12 hours or so at 70 degrees F.

G. Fine Grinding
1. Grind with 120-220 grit diamond/stones until all grout has been removed from the terrazzo surface. EXTRA PRECAUTION SHOULD BE TAKEN NOT TO OVER GRIND THE FLOOR.
2. The final polish will be done at 400 grit, using diamond grinding pads, or higher.

H. Cleaning and Sealing
1. Rinse with clean water and allow to thoroughly dry.
2. Seal: Apply penetrating sealer, per manufacturer’s directions by a qualified manufacturer such as Master Terrazzo.
3. Upon completion, this work shall be ready for final inspection and acceptance by the owner.
4. Remove protection and clean any adjacent surfaces effected by the refinishing process.

3.05 INSTALLATION, EPOXY TERRAZZO

A. General:
   1. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type and accessory indicated unless more stringent requirements are specified within this section.
   2. Comply with written directions of product manufacturer.
   3. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control joint strips.
   4. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

B. Full Membrane Application
   1. Flexible Reinforcing Membrane:
      a. Prepare and prefill substrate cracks with concrete patch and topping material or with primer and allow to cure.
      b. Apply 25 mils of crack isolation membrane over prepared substrate to produce full substrate coverage in areas to receive terrazzo.
      c. Apply second coat of crack isolation membrane, 15 mils thick and install reinforcing fabric.
      d. Prepare membrane according to manufacturer's written instructions before applying primer.
   2. Primer: Install primer if required by manufacturer over crack isolation membrane.

C. Crack Detailing Application
   1. Crack Treatment : After surface preparation, fill less than 1/16 inch (1.6 mm) wide with crack isolation membrane. Apply detail coat of crack isolation membrane over cracks and embed 12 inches (300 mm) wide strips of membrane reinforcing fabric.
   2. Crack Treatment : Fill cracks and joints which are greater than 1/16 inch (1.6 mm) width with crack isolation membrane or primer.
      a. Apply minimum 30 mil detail coat of crack isolation membrane. Extend coverage at least 12 inches (300 mm) on each side of crack.
      b. After crack isolation membrane has leveled, lay minimum 9 inches (230 mm) wide precut strips of membrane reinforcing fabric into uncured crack isolation membrane. Saturate reinforcing fabric with additional crack isolation membrane.
   3. Primer: Apply epoxy primer evenly over entire prepared substrate, including cracks and non-expansion joints, at a rate of 200-250 square feet per gallon (5 - 6 sq. m per liter).
      a. Thoroughly wet surface with primer.
      b. Do not allow primer to pond.

D. Divider and Accessory Strips: Install in locations indicated in adhesive setting bed without voids below strips.
   1. Anchoring Strips: Adhere the strips to the floor with primer or hot glue.

E. Control Joint Strips: Provide one of the following where indicated:
   1. Back to Back Strips: Install L-type divider strips back to back over full membrane parallel to control and non-doweled construction joints leaving a space appropriate for anticipated movement - typically 1/4 to 3/8 inch (6 to 9.5 mm) according to NTMA Technical Bulletin #111, Detail #1.
      a. Fill gap between control joints with joint sealant.
   2. Single Strip: Fill saw cut joint with control joint filler. Place L-type divider strip on concrete adjacent to joint according to NTMA Technical Bulletin #111, Detail 2.

F. Placing Terrazzo:
   1. Mix terrazzo binder with chips and fillers in ratios as approved by manufacturer.
   2. Trowel-apply terrazzo mixture over epoxy primer to provide smooth seamless surface at a minimum of 3/8 inch (9.5 mm) thick.
      a. Allow terrazzo mixture to cure per manufacturer's recommendations prior to grinding operations.

G. Rough Grinding: Grind with 24 grit or finer stones or with comparable diamond plates.

H. Intermediate Grinding: Follow initial grind with 80 grit or finer stones .

I. Grouting: Prior to final grinding, apply epoxy grout as follows:
   1. Cleanse floor with clean water and rinse thoroughly.
   2. Remove excess rinse water by wet vacuum and machine until completely dry.
   3. Apply epoxy grout to fill voids.

J. Fine Grinding: Grind with 800 grit stones until all grout is removed from surface.
   1. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding.
   2. Produce surface with a minimum of 70 percent aggregate exposure.

K. Remove terrazzo in areas where terrazzo fails to bond properly to substrate and install new terrazzo.
   1. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo.

L. Construction Tolerances: Limit variation in terrazzo surface from flat to 1/4 inch in 10 feet (6 mm in 3 m).

3.06 INSTALLATION, PRECAST TERRAZZO

A. Set units using method recommended by NTMA and by epoxy terrazzo flooring manufacturer unless otherwise indicated.

B. Set units with alignment level and true to dimensions, varying 1/8 inch (3.2 mm) maximum in length, height, or width.

C. Seal joints between units with joint sealants.

3.07 ADJUSTING

A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.08 CLEANING

A. Cleaning:
   1. Wash surfaces with cleaner according to NTMA's Maintenance Guide and manufacturer's written instructions.
   2. Remove grinding dust from installation and wash surfaces according to manufacturers recommended cleaning procedures.
   3. Allow surfaces to thoroughly dry before sealing.

3.09 PROTECTION

A. Protect surrounding substrates and surfaces, as well as in-place equipment from damage during surface preparation and system application.

B. Maintain area where terrazzo work is being done be free of other trades during surface preparation, crack detailing, divider strip installation, terrazzo pouring, and for a period of 36 hours upon completion.

C. Sealing:
   1. Seal surfaces according to NTMA's written recommendations.
   2. Apply terrazzo sealer according to sealer manufacturer's written instructions.

D. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 09 67 00
TROWELED SEAMLESS FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Troweled seamless flooring and base.

1.02 REFERENCE STANDARDS

A. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

B. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.

C. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2008.

D. ASTM D905 - Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading; 2008 (Reapproved 2013).

E. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2014.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

G. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

H. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

1.03 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

B. Samples for verification: Submit two samples, 4 x 4 inch (100 x 100 mm) in size illustrating color and pattern for each floor material for each color specified.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section.
   1. Minimum three years of documented experience.
   2. Approved by manufacturer.

C. Supervisor Qualifications: Trained by product manufacturer, under direct full time supervision of manufacturer's own foreman.

1.05 MOCK UP

A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
   1. Number of Mock-Ups to be Prepared: One per product type.
   2. Use same materials and methods for use in the work.
   3. Locate where directed.

B. Obtain approval of mock-up by Architect before proceeding with work.

C. Approved mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.07 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F (13 degrees C).

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 FLUID-APPLIED FLOORING SYSTEMS

A. Troweled Seamless Flooring and Base:

1. Physical Characteristics:Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E 648.
   a. Tensile Strength: 1,000 psi (6.89 MPa), when tested in accordance with ASTM D 638.
   b. Compressive Strength: 5,000 psi (34.45 MPa) , when tested in accordance with ASTM C 579.
   c. Abrasion Resistance: Maximum weight loss of.03 g/1000 cycles, when tested in accordance with ASTM D 4060.
   d. Impact Resistance: >160 in/lb (__ Nm); no cracking, chipping or delamination, when tested with Gardner Impact Tester.
2. Manufacturers and products Type RF-1:
   a. Stonhard; Product: Stontec UTF: www.stonhard.com
      1) 2mm urethane flake broadcast flooring system with integral cove base where noted
      2) Primer as required by manufacturer.
      3) Undercoat: A three-component, polyaspartic urethane resin, aliphatic isocyanate and filler.
      4) 4) Brightly colored, quartz broadcast aggregate
      5) Color Flake Broadcast Layer: Brightly colored vinyl flakes.
      6) Sealer: Stonseal CA7, a two-component, UV resistant, aliphatic polyaspartic urethane sealer.
   b. Crossfield Dex-O-Tex Tek Crete SLCF
3. Manufacturers and products Type RF-2:
   a. Stonhard; Product: Stonshield UTS: www.stonhard.com
      1) self-priming, textured, four-component, polyurethane mortar and broadcast system consisting of a urethane-urea binder, pigments, powders and quartz aggregates
      2) Thickness: nominal 1/4 in. (6 mm).
      3) Mortar: Stonclad UT, four-component multi-functional urethane area slurry.
      4) 4) Aggregate: brightly colored quartz broadcast aggregate
      5) Color Flake Broadcast Layer: Brightly colored vinyl flakes.

6) Undercoat and Sealer: Stonseal CA7, a two-component, UV resistant, aliphatic polyaspartic urethane sealer..

b. Crossfield Dex-O-Tex Tek Crete SLCQ

2.02 ACCESSORIES

A. Divider Strips: Zinc, 1/8 inch (____ mm) thick, height to match flooring thickness, with anchoring features; color as selected.

B. Control Joint Strips: Match divider strips; 1/8 inch (____ mm) nominal width, 1/8 inch (3 mm) wide neoprene filler strip between side strips, with anchoring features, strip height to suit flooring thickness.

C. Base Caps: Zinc with projecting base of 1/8 inch (3 mm); _____ color.

D. Subfloor Filler: type recommended by flooring material manufacturer.

E. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by flooring materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

D. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - ACCESSORIES

A. Accurately saw cut substrate to install divider strips.

B. Install strips straight and level to locations indicated.

C. Install fillet strips at base of walls where flooring is to be extended up wall as base.

D. Install terminating cap strip at top of base; attach securely to wall substrate.

3.04 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

D. Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate at manufacturer's recommended height using specially designed trowel and or Screed box.

E. Undercoat: Remove any surface irregularities by lightly abrading and vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and coverage rates.

F. Broadcast: Immediately broadcast quartz silica aggregate into the undercoat using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

G. Apply topcoat in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

H. Cove at vertical surfaces. Base height: 6" unless otherwise indicated.

3.05 TERMINATIONS

A. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal the flooring system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.06 JOINTS AND CRACKS

A. Treat control joints to bridge potential cracks and to maintain monolithic protection.

B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.07 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

B. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006 (Reapproved 2011).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

C. CRI (GLP) - Green Label Plus Testing Program - Certified Products; www.carpet-rug.org; current edition.

D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.04 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Carpet Tile Type CT-1, CT-2: Tufted, manufactured in one color dye lot.

1. Product: “No Rules” Tile manufactured by Shaw.
2. Tile Size: 24 x 24 inch (610 x 610 mm), nominal.
3. Dye method: 100% solution dyed.
4. Color: as indicated.
5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").

B. Carpet Tile Type CT-3, CT-4: Tufted, manufactured in one color dye lot.
1. Product: Retro Rogue Mix and Match Tile 12BY36 manufactured by Mohawk.
2. Tile Size: 9 x 36 inch (610 x 610 mm), nominal.
3. Dye method: 100% solution dyed.
4. Color: as indicated.
5. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E 648 or NFPA 253.
6. Surface Flammability Ignition: Pass ASTM D 2859 (the "pill test").

C. Walk-off Carpet Tile, Type WCT -1: Tufted, manufactured in one dye lot.
1. Product: “Traverse” as Manufactured by Mannington.
2. Tile Size: 24 by 24 inch, nominal.
3. Color: As indicated.

2.02 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, color as selected.

C. Stair Nosing: Rubber type, square nose, ribbed top surface, one piece per stair tread width , color as selected.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

C. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by carpet tile manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction alternating to next unit, set parallel to building lines, unless otherwise indicated.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 68 16
SHEET CARPETING

PART 2 PRODUCTS

1.01 CARPET

END OF SECTION

SECTION 09 77 00
GRAPH MODULAR WALL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

2.01 SCOPE: SECTION INCLUDES, BUT IS NOT LIMITED TO, INTERIOR ARCHITECTURAL MODULAR WALL SYSTEM INCLUDING TRIMS, TERMINATIONS, MISCELLANEOUS METAL AND SUB-FRAMES, CLIPS, FASTENERS AND OTHER DEVICES FOR SECURE ANCHORAGE OF PANELS TO CONVENTIONAL DRYWALL OR OTHER SUBSTRATE PROVIDED FOR THIS PURPOSE.

2.02 RELATED SECTIONS:

A. Section 09 20 00 Plaster and Gypsum Board

B. SUBMITTALS
1. Shop Drawings: Submit complete shop drawings indicating quantities, finishes, dimensions and attachment relationships.
2. Product Data: Submit manufacturer's product data, specifications and installation instructions.
3. Samples: Submit color and finish samples to determine range of texture and consistency of color and finish expected in the finished work. Standard sample size shall be 3" x 3".

C. QUALITY ASSURANCE
1. Manufacturer shall have a minimum of five years experience in manufacturing architectural materials.

D. DELIVERY, STORAGE AND HANDLING
1. Deliver components in clearly marked containers and packages suitable for shipment of specified products so as to prevent finish damage in transit.
2. Store components only in secured ambient environment (humidity min. 25% - max 55%, temperature not to exceed 80 degrees). Store in dry locations that will avoid damage from job-site traffic, moisture, stacking of materials and other job-site contamination. Do not stack panels directly on floor. Do not subject panels to moisture.
3. Handle components to avoid racking, twisting, denting or scratching of finished surfaces.

E. WARRANTY
1. Provide manufacturers' warranty against defects in material and workmanship for a period of one year.

PART 2 - PRODUCTS

MANUFACTURER

BASIS OF DESIGN IS:

5.01 GRAPH MODULAR WALL SYSTEM FRY REGLET CORPORATION

5.02 ALPHARETTA, GA - SANTA FE SPRINGS, CA PHONE 800-237-9773

5.03 FAX 770-521-9034

5.04 WWW.FRYREGLET.COM

A. MATERIALS
1. A. Framing Assemblies: Framing components to be fabricated from extruded 6063 T5 aluminum:
2. Finishes: ** Standard anodized finish Architectural 200R1 medium etch (AA-M32c10A21), clear anodized color **

a. -or-
b. ** Factory powder paint **
c. Framing components to be fabricated from extruded 6463 T5 aluminum:
d. Intermediate Fin Type:
e. Outside Corner Type:

5.05 ** SINGLE FIN ** -OR-

5.06 ** DOUBLE FIN ** -OR-

5.07 ** SHADOW FIN ** -OR-

5.08 ** BUTT REVEAL ** -OR-

5.09 ** CUSTOM EXTRUSION **

5.10 ** 1.25" X 1.25" "X" CORNER ** -OR-

5.11 ** 3/8"X3/8" "X" CORNER ** -OR-

5.12 ** 1.25" X 1.25" "SQUARE" CORNER ** -OR-

5.13 ** 3/8"X3/8" "SQUARE" CORNER ** -OR-

5.14 ** 3/8"X3/8" "BULLNOSE" CORNER ** -OR-

5.15 ** CUSTOM CORNER EXTRUSION **

A. B. Infill Panel Substrates (for wood veneer and laminates only):
1. ¾" medium density fiberboard (MDF), 48# density, minimum internal bond strength of 120# SI. Class A. -or-
2. ¾" fire rated medium density fiberboard (MDF), 48# density, minimum internal bond strength of 120# SI. Class A. -or-
3. ¾" fire rated, NAUF, LEED Certified medium density fiberboard (MDF), 48# density, minimum internal bond strength of 120# SI. Class A.
4. -or-
5. ¾" fire rated particleboard, 47-50 # density, internal bond strength of 80# PSI. Class A. (REQUIRED FOR WOOD VENEER PANELS)

B. SELECT Material Type and Finish from the Following:
1. ** Wood Veneer ** (specify veneer type & finish): Architectural grade quarter cut veneer (.035" thick) applied to the substrate via cold press with balancing backer sheet.
2. ** Plastic Laminate ** (specify manufacturer & finish): Plastic laminate applied to a ¾" substrate via cold press with balancing backer sheet.
3. ** Metal Laminate ** (specify manufacturer & finish): Metal laminate over 1/16" phenolic backer, applied to a ¾" substrate via cold press with balancing backer sheet.
4. ** Sublimated Digital Image **: Lambda digital printing mounted second surface behind ¼" clear acrylic panels. Imagery from "production ready" art files.
5. ** Solid Resin ** (specify manufacturer & finish): Glycol modified engineered polyester resin, ¼" thick, opaque panels.
6. ** Phenolic Compact Laminate Panels ** (specify manufacturer & finish): 5/16" or 3/8" thick phenolic panels.
7. ** Fabric Wrapped Acoustical Panel ** (specify fabric manufacturer & type): ½" + thick, fiberglass core with hardened face wrapped with specified fabric on panel face and four edges, returned and sealed to back edge of panel.
8. ** Solid Surface Panels ** (specify manufacturer & finish): ½" solid surface panels with square edges

C. 2.3 FABRICATION
   1. Aluminum framing components to be factory mitered and welded to form subassemblies of 2-way, 3-way and 4- way intersections, inside and outside corners and custom intersections as detailed in manufacturer's shop drawings. Modular wall system shall be capable of providing a
      a. (indicate the reveal of your choice from the following selection) **Single Fin (fine line)**
      b. **Double Fin (7/16" reveal - ¼" open)** **Butt Reveal, no Fin (min 1/16" open)**
   2. Reveal joint with an anodized aluminum exposed element bordering each panel horizontally, vertically or in both directions in accordance with Architectural drawings. All other details, including base, head, corners, intersections etc. shall be fabricated in accordance with the Architectural drawings.
   3. Infill panels shall be installed in a non-progressive manner and must be point accessible.

PART 3 - EXECUTION

3.1 PREPARATION:

7.01 EXAMINE JOB-SITE CONDITIONS TO VERIFY THAT WALLS TO RECEIVE CLADDING ARE DRY, FLAT AND RIGID. RECOMMENDED STUD SPACING 16" OR 24" O.C. FRAMING MUST CONFORM TO ML/SFA 540 SPECIFICATION:

A. Vertical alignment (plumbness) of walls shall be within 1/960th (1/8" in 10 feet) of the span

B. Horizontal alignment (levelness) of walls shall be within 1/960th (1/8" in 10 feet) of their respective heights. 3. Squareness of walls shall be not more than 1/8" out of square within the length of that wall.
   1. Climate control: Material must be stored, installed and maintained only in secured ambient environment (humidity min. 25% - max 55%, temperature not to exceed 80 degrees)

C. Verify dimensions of wall panels prior to installation to assure compatibility with job-site conditions.

D. 3.2 INSTALLATION
   1. Install vertical main runners and horizontal cross runners in accordance with manufacturer's installation instructions and approved shop drawings. Vertical and horizontal runners must be plumb, true and level as described in 3.1.A.
   2. B. All panels with a wood substrate must be allowed to acclimate to the project environmental conditions prior to installation. Refer to Graph Wood Panel Acclimatization Instructions for complete information.
   3. C. Wall panels shall be erected plumb, level, square, true to line, securely anchored and in proper alignment and relationship to work of other trades.

E. 3.3 CLEANING AND PROTECTION
   1. Visually inspect all exposed surfaces for scratches or blemishes. Protection of wall panels from damage by other trades after installation shall be the responsibility of the General Contractor.

END OF SECTION

SECTION 09 81 00
ACOUSTICAL INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Acoustic insulation used alone or in conjunction with other materials to provide acoustical isolation.

B. Related Sections:
1. Section 072100 - Thermal Insulation
2. Section 092116 - Gypsum Board: Acoustical batt insulation in cavity walls.
3. Section 098400 - Acoustic Room Components

1.02 SUBMITTALS

A. Product Data: Submit product data for insulation types.

B. Shop Drawings: Submit shop drawings of insulation used in assemblies, indicating thickness, attachment, and finish material.

C. Samples:
1. Submit 12 by 12 inch samples of each color specified for Architect's verification.

D. Submit following Informational Submittals:
1. Test Reports:
   a. Submit independent laboratory sound transmission test report on letterhead of testing laboratory.
   b. Submit certified test reports on composite fabric and backing flame spread and smoke contribution.
2. Certifications specified in Quality Assurance article.
3. Qualification Data: Manufacturer's qualification data.
4. Manufacturer's instructions.
5. Manufacturer's field reports.

E. Closeout Submittals:
1. Maintenance data.

1.03 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Regularly engaged in manufacture of acoustical insulation for commercial use on 10 projects of similar nature in past 3 years.

B. Regulatory Requirements: Ensure components and completed installation comply with fire resistive standards of applicable local, state, and federal codes, laws and ordinances. Flame spread index shall not exceed 25, and smoke density shall not exceed 50 when tested in accordance with ASTM E84 in manner representative of actual installation.

C. Certifications: Certify compliance with specified NRC ratings.

1.04 FIELD SAMPLES

A. Sample Installation:
1. Install 2 full size panels in area designated by Architect.
2. Show edge treatment, applied mesh, and hanging techniques.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Immediately inspect material upon arrival at site for defects and damage.

B. Safeguard against disfiguration, contamination, and damage by physical abuse or abuse from other harmful materials.

C. Store materials in clean, dry area, and protect from construction traffic.

PART 2 - PRODUCTS

2.01 ACOUSTICAL INSULATION TYPES

A. Acoustical Insulation - Cavity Insulation for Sound Rated Partitions. Refer to Section 092900 Gypsum Board.

B. Acoustical Insulation - Black Faced Fiberglass Board
   1. Fiberglass board for walls and ceilings shall be 2-inch or 4-inch thick, as called out in the drawings or specifications. It shall be installed on the undersides of the roof deck as shown on the drawings.
   2. Fiberglass board shall be fiberglass insulation with a black mat surface acrylic coating without manufacturer's markings. This coating shall be damage resistant, not tearing or abrading easily. Fiberglass board shall be 3 lb/ft3 minimum density meeting the requirements of NFPA 90-A. Fiberglass board and adhesives shall comply with ASTM E-84 and shall have a maximum flame spread rating of 25 and smoke rating of 50.
   3. Fiberglass board shall conform to ASTM C 423 standard "Sound Absorption" and have the following minimum sound absorption coefficients when tested in accordance with ASTM C423 and E795 procedures mounting type "A":
      a. NRC 0.80 at 2-inches thick; NRC 1.00 at 4-inches thick.
   4. The following are acceptable, subject to the above:
      a. Select Sound Black Acoustic Board from Owens Corning Fiberglas Corporation, Toledo, OH.
      b. AcoustaBoard Black or CertaPro AcoustaBoard Black from CertainTeed, Valley Forge, PA.
      c. INC C-700 from Industrial Noise Control, North Aurora, IL.

C. Acoustical Insulation - Fabric Wrapped Acoustical Panels for walls and ceilings. Refer to Section 098400 Acoustic Room Components.

D. Acoustical Insulation - Perimeter Isolation Board at Floating Wood Floor System.

E. Acoustical Insulation - Safing Insulation.
   1. Safing insulation should be 4-5 lb/ft3 density unfaced semi-rigid fiberglass or mineral wool material. Thickness as called out on the drawings or as required to fully pack voids. Safing insulation should be dimensionally stable and should not slump within cavity. Safing insulation should be inorganic, rot, mildew and vermin proof and should not corrode steel, copper and aluminum. Flame spread and smoke developed index not to exceed 25 and 50 respectively per ASTM E-84.
   2. The following are acceptable, subject to the above:
      a. Safing Insulation or Mineral Wool from Owens Corning Fiberglas Corporation, Toledo, OH. (800) 438-7465
      b. Pyro Fiber Safing from Johns Manville Mechanical Insulation Division, Denver, CO. (800) 654-3103

F. Acoustical Insulation - Sound Absorptive Material for Acoustical Ceilings, Floating Floors and Penetrations.
   1. Sound absorptive material for above acoustical ceilings, under floating floors and for around penetrations in walls and floor/ceiling assemblies shall be fiberglass or mineral fiber with a density of 1-1/2 lb/ft3. Thickness shall be as called out on the drawings. It

shall be unfaced and supplied in semi-rigid board form. Flame spread and smoke developed index not to exceed 25, per ASTM E-84. Material shall be non-combustible per ASTM E136. Where large penetrations occur in fire-rated constructions, the use of semi-rigid fire-rated mineral wool safing may be required.

2. Material to be laid directly on upper side of sound control ceiling, or between vibration isolation supports in floating floor constructions. For use in sealing penetrations of acoustically-rated partitions, pack material completely in space between penetrating object and partition, leaving no voids or spaces.
3. The following are acceptable, subject to the above:
   a. Industrial Insulation Type 701 unfaced, from Owens Corning Fiberglas Corporation, Toledo, OH. (800) 438-7465
   b. Insul-Shield 150 from Johns Manville, Denver, CO. (800) 654-3103
   c. Insulation Board from Knauf Fiber Glass GmbH, Shelbyville, IN. (317) 398-4434

2.02 ACCESSORIES

A. Insulation Impaling Fasteners:
   1. Impaling pins consisting of metal spindle with perforated base plate for adhesive application.
   2. Spun aluminum friction fit retainer caps.
   3. Select length to suit insulation thickness so insulation is depressed same thickness for visual uniformity.
   4. Adhesive: As recommended by impaling pin manufacturer for project substrates and insulation thickness.
   5. Retainer Caps:
      a. RC 10 washers and “Dome Cap Washer” matching Architect’s sample by AGM (Western Welding Systems; 1.800.287.9873).
      b. Dome Cap, Gemco.
      c. Paint caps and washers flat black unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 INSTALLATION

A. Install acoustical insulation plumb, level, in proper alignment.

B. Anchor components securely in place after proper alignment.

C. Scribe insulation to fit adjacent work.

D. Butt joints tightly.

E. Apply accessories and concealed fastenings as recommended by manufacturer.

F. Impaling Pins at Exposed Insulation:
   1. Adhere impaling pins to clean, dry sound substrates with recommended adhesive.
   2. Locate impaling pins in pattern indicated on Drawings. Provide symmetrical layout on visually acceptable grid.
   3. Layout insulation so joints align in both directions; provide insulation panels of same size and symmetrically located within wall or ceiling area.
   4. Supplement ceiling impaling pins with spray adhesive to hold horizontally mounted insulation.
   5. Cut insulation panels with sharp knife to achieve clean-cut edges.

6. Do not use small pieces of insulation where single piece will fit.
7. Impale insulation panels onto spindle with edges tightly butted.
8. Install retainer caps over spindle without over-compressing insulation.
9. Touch-up painted caps with paint to match insulation; flat black or white.

G. Remove and replace panels which have been damaged and are unacceptable to Architect.

3.03 ADJUSTING

A. Adjust installed panels to ensure ends and edges of adjacent panels are flush and in alignment with each other, unless otherwise indicated.

3.04 CLEANING

A. Clean finished surfaces and accessories in accordance with manufacturer's directions.

B. Cover or otherwise protect installed work to prevent soiling.

C. Clean and repair surfaces soiled or otherwise damaged in connection with work of this Section. Pay cost of replacing finishes or materials that cannot be satisfactorily cleaned or which have been damaged by improper cleaning materials and techniques.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Surfaces to be finished are indicated in this section and on the Drawings.

D. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.

E. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum.
   6. Marble, limestone, granite, slate, and other natural stones (UON).
   7. Floors, unless specifically indicated.
   8. Brick, architectural concrete, cast stone, integrally colored plaster and stucco (UON).
   9. Exterior insulation and finish system (EIFS).
   10. Glass.
   11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 74 19 – Construction Waste Management.

B. Section 01 81 13 – Sustainable Design Requirements.

C. Section 01 81 14 – Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints & Coatings.

D. Section 01 81 19 – Indoor Air Quality Requirements.

E. Section 05 50 00 - Metal Fabrications: Shop-primed items.

F. Section 09 91 23 - Interior Painting.

1.03 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

C. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

D. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 LEED REQUIREMENTS

A. LEED Focus Materials (LFMs) For This Section:

1. Targeted products containing Recycled Content (MRc4)
2. Targeted products containing Regional Material (MRc5)
3. Targeted products to meet VOC requirements (EQc4.1 & EQc4.2)

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Maintenance Data: Submit data including product technical data sheets and material safety data sheets (MSDS).

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

G. LEED Product and Material Data Summary Form: For all installed products and materials of this Section, complete the “LEED Product and Material Data Summary Form” (attached to end of Section 01 81 13 - Sustainable Design Requirements)
   1. Product Material Cost: Provide the cost for material, or an assembled product, including taxes and delivery but excluding any cost for labor and equipment required for installation after the material is delivered to the site.
   2. Product Data for Credit MRc4, Recycled Content: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
   3. Product Data for Credit MRc5, Regional Material: For products having regional materials, documentation indicating location of raw material extraction, harvest or recovery, as well as, manufacture (location of final assembly) within 500 miles of project site. Include statement indicating cost for each material or component of the assembled product.
   4. Product Data for Credit EQc4.2, Paints & Coatings: For paints and coatings, documentation including printed statement of VOC content and chemical components.

1.07 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years documented experience.

B. Sustainability and LEED Standards Certification:
   1. Regional manufactured products with percentage by weight.
   2. Recycled content calculated as 1/2 preconsumer + postconsumer.

3. VOC content limitations defined in Section 018114, "Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, and Coatings."

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

C. Paints: Acceptable manufacturers are limited to the following:
   1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   2. Benjamin Moore & Co: www.benjaminmoore.com.
   3. Glidden Professional: www.gliddenprofessional.com.

D. Primer Sealers: Same manufacturer as top coats.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

3. Supply each paint material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 81 14.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
2. Allow for minimum of five colors for each system, unless otherwise indicated, without additional cost to Owner.
3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

E. Provide Premium Grade systems (2 top coats).

2.03 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Alkali Resistant Water Based Primer.
a. Products:
1) Sherwin-Williams Loxon Concrete & Masonry Primer/Sealer.
2. Interior/Exterior Latex Block Filler.
a. Products:
1) Sherwin-Williams Pro Industrial Heavy Duty Block Filler.
3. Water Based Primer for Galvanized Metal.
a. Products:
1) Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer.
4. Bonding Primer, Water Based.
a. Products:
1) Sherwin-Williams Extreme Bond Primer.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

I. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Paint all exposed surfaces except where indicated not to be painted or to remain natural; the term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.
   1. Paint surfaces behind movable equipment and furnishings the same as similar exposed surfaces.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of the permanent item.

D. Paint back sides of access panels and removable and hinged covers to match exposed surfaces.

E. Finish top, bottom, and side edges of exterior doors the same as exposed faces.

F. Paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment occurring in finished areas to match background surfaces, unless otherwise indicated.

G. Apply products in accordance with manufacturer's instructions using the preparation, products, sheens, textures, and colors as indicated.
   1. Remove, refinish, or repaint work not complying with requirements.

H. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.

I. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.
   1. Number of coats and film thickness required are the same regardless of application method.
   2. 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.
   3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.

J. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
   1. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.
   2. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
   3. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
   4. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat will not cause the undercoat to lift or lose adhesion.
   5. If manufacturer's instructions recommend sanding to produce a smooth, even surface, sand between coats.
   6. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
   7. Pigmented (Opaque) Finishes: Provide smooth, opaque surface of uniform finish, color, appearance, and coverage.

K. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

L. Sand wood and metal surfaces lightly between coats to achieve required finish.

M. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

C. Protect finishes until completion of project.

D. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Field applied primers are in addition to shop primers.

D. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Elevator pit ladders.
   3. Prime surfaces to receive wall coverings.
   4. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
      d. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

E. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   10. Glass.
   11. Acoustical materials, unless specifically indicated.
   12. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 74 19 – Construction Waste Management.

B. Section 01 81 13 – Sustainable Design Requirements.

C. Section 01 81 14 – Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints & Coatings.

D. Section 01 81 19 – Indoor Air Quality Requirements.

E. Section 05 50 00 - Metal Fabrications: Shop-primed items.

F. Section 05 51 00 - Metal Stairs: Shop-primed items.

G. Section 09 91 13 - Exterior Painting.

1.03 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

C. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

D. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 LEED REQUIREMENTS

A. LEED Focus Materials (LFMs) For This Section:
   1. Targeted products containing Recycled Content (MRc4)
   2. Targeted products containing Regional Material (MRc5)
   3. Targeted products to meet VOC requirements (EQc4.1 & EQc4.2)

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including product technical data sheets and material safety data sheets (MSDS).

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

H. LEED Product and Material Data Summary Form: For all installed products and materials of this Section, complete the “LEED Product and Material Data Summary Form” (attached to end of Section 01 81 13 - Sustainable Design Requirements)

1. Product Material Cost: Provide the cost for material, or an assembled product, including taxes and delivery but excluding any cost for labor and equipment required for installation after the material is delivered to the site.
2. Product Data for Credit MRc4, Recycled Content: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Data for Credit MRc5, Regional Material: For products having regional materials, documentation indicating location of raw material extraction, harvest or recovery, as well as, manufacture (location of final assembly) within 500 miles of project site. Include statement indicating cost for each material or component of the assembled product.
4. Product Data for Credit EQc4.2, Paints & Coatings: For paints and coatings, documentation including printed statement of VOC content and chemical components.

1.07 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years documented experience.

B. Sustainability and LEED Standards Certification:
1. Regional manufactured products with percentage by weight.
2. Recycled content calculated as 1/2 preconsumer + postconsumer.
3. VOC content limitations defined in Section 018114, "Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, and Coatings."

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

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

D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

C. Paints and Coatings:
   1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   2. Benjamin Moore: www.benjaminmoore.com.
   3. Glidden Professional: www.gliddenprofessional.com.

D. Primer Sealers: Same manufacturer as top coats.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 81 14.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

F. Provide Premium Grade systems (2 top coats).

2.03 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Interior/Exterior Latex Block Filler.
      a. Products:
         1) Sherwin-Williams PrepRite® Block Filler, B25W25.
         2) Corotech Acrylic Block Filler V114
   2. Interior Drywall Primer Sealer.
      a. Products:
         1) Sherwin-Williams ProMar Latex 200 Primer .
         2) Benjamin Moore Ultra Spec 500 Interior Latex Primer N534
   3. Interior Rust-Inhibitive Water Based Primer.
      a. Products:
         1) Sherwin-Williams Pro Industrial Pro-Cryl® Primer, B66-310 Series.
         2) Corotech Prep All Universal Metal Primer V132

4. Bonding Primer, Water Based.
   a. Products:
      1) Sherwin-Williams Extrem Bond Primer.
      2) Benjamin Moore Super Spec HP Acrylic Metal Primer P04

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of water and bleach. Rinse with clean water and allow surface to dry.

G. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

H. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

I. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Paint all exposed surfaces except where indicated not to be painted or to remain natural; the term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.

1. Paint surfaces behind movable equipment and furnishings the same as similar exposed surfaces.

B. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of the permanent item.

C. Paint back sides of access panels and removable and hinged covers to match exposed surfaces.

D. Finish top, bottom, and side edges of exterior doors the same as exposed faces.

E. Paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment occurring in finished areas to match background surfaces, unless otherwise indicated.

F. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

G. Apply products in accordance with manufacturer's written instructions using the preparation, products, sheens, textures, and colors as indicated.

H. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

I. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

J. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

K. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

L. Sand wood and metal surfaces lightly between coats to achieve required finish.

M. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

N. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 11 01
VISUAL DISPLAY BOARDS AND DISPLAY CASES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Markerboards

B. Tackboards

C. Markerboards and Tackboards.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.

B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

C. Samples: Submit color charts for selection of color and texture of markerboard, tackboard, tackboard surface covering, and trim.

D. Test Reports: Show conformance to specified surface burning characteristics requirements.

E. Manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

A. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Claridge Products and Equipment, Inc; ____: www.claridgeproducts.com/#sle.

B. Polyvision Corporation; ____: www.polyvision.com/#sle.

C. Visual Display Boards:

1. Claridge Products and Equipment, Inc: www.claridgeproducts.com.
2. Polyvision Corporation (Nelson Adams); Product Polyvision 500 Series P3 ceramicsteel boards: www.polyvision.com is the Basis of Design.
   a. Fabricators shall be limited to those approved by manufacturer.
   b. Approved manufacturer/fabricator: ABC School Equipment/Platinum Visual Systems

2.02 VISUAL DISPLAY BOARDS

A. Markerboards: Porcelain enamel on steel, laminated to core.

1. Color: As selected from manufacturer's full range.

2. Steel Face Sheet Thickness: 24 gage, 0.0239 inch (0.61 mm).
3. Core: Particleboard, 1/2 inch (13 mm) thick, laminated to face sheet.
4. Backing: Aluminum foil, laminated to core.
5. Size: As indicated on drawings.
6. Frame: Extruded aluminum, with concealed fasteners.
7. Frame Profile: Box chalktray with end closures; 1 1/2" perimeter trim
8. Frame Finish: Anodized, natural.
9. Accessories: Provide chalk tray and map rail with 2" tack strip, hanging devices for audio-visual aids.

B. Tackboards: Composition cork.
1. Cork Thickness: 1/4 inch (6 mm).
2. Color: As selected from manufacturer's full range.
3. Backing: Hardboard, 1/4 inch (6 mm) thick, laminated to tack surface.
4. Size: As indicated on drawings.
5. Frame: Same type and finish as for markerboard.
6. Frame Profile: 1 1/2" perimeter trim.
7. Frame Finish: Anodized, natural.
8. Accessories: Provide map rail.

C. Combination Units and Units Made of More Than One Panel: Factory-assembled markerboards and tackboards in a single frame, of materials specified above.
1. Join panels of different construction with H-shaped extruded aluminum molding finished to match frame.
2. Join panels of similar construction with butt joints, aligned and secured with steel spline concealed in edge of core.
3. Configuration: As indicated on drawings.
4. Units Too Large to Ship Assembled: Fully assembled in factory, then disassembled for shipping.

D. Glass Markerboards
1. Glass: Two layers of 6 mm (1/4”) low-iron, fully tempered; laminated with frosted inner layer.
2. Edge work: polished edges; corners: eased.
3. Basis of Design: Architectural Series, manufactured by Clarus; Glassboards: www.clarusglassboards.com
4. Hardware: stainless steel standoff; minimum four per board.
a. Boards up to 48" wide: minimum four per board.
b. Boards up to 96" wide: minimum six per board.

2.03 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.

C. Foil Backing: Aluminum foil sheet, 0.005 inch (0.13 mm) thick.

D. Adhesives: Type used by manufacturer.

2.04 ACCESSORIES

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 2 inch (50 mm) wide, full width of frame.

B. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail. Provide 2 per board.

C. Temporary Protective Cover: Sheet polyethylene, 8 mil (0.2 mm) thick.

D. Flag Holders: Cast aluminum bored to receive 1 inch (25 mm) diameter flag staff, bracketed to fit top rail of board. Provide one per classroom, plus 8 additional units.

E. Cleaning Instruction Plate: Provide instructions for chalkboard cleaning on a metal plate fastened to perimeter frame near chalkrail.

F. Chalk Tray: Aluminum, manufacturer's standard profile, one piece full length of chalkboard, molded ends, concealed fasteners, same finish as frame.

G. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

C. Verify flat wall surface for frameless adhesive-applied boards.

3.02 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Install with top of chalk tray at 30 inches (760 mm) above finished floor, unless otherwise noted.

C. Secure units level and plumb.

D. Butt Joints: Install with tight hairline joints.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Concealed steel support members.

B. Section 05 50 00 - Metal Fabrications: Concealed steel support members.

C. Section 06 10 00 - Rough Carpentry: Blocking and supports.

D. Section 10 28 00 - Toilet Accessories.

1.02 REFERENCE STANDARDS

A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, _4___by___4_ inch (____by____ mm) in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:

1. Scranton Products (Santana/Comtec/Capital); Hiney Hiders: www.scrantonproducts.com/#sle.

2.02 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor and ceiling anchored.

1. Doors:
   a. Thickness: 1 inch (25 mm).
   b. Width: 24 inch (610 mm).
   c. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
   d. Height: 55 inch (1397 mm).
2. Panels:
   a. Thickness: 1 inch (25 mm).
   b. Height: 55 inch (1397 mm).
3. Pilasters:
   a. Thickness: 1 inch (25 mm).
   b. Width: As required to fit space; minimum 3 inch (76 mm).

2.03 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
   2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.

B. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.

C. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

D. Hinges: Stainless steel, manufacturer's standard finish.
   1. Continuous-type hinge, self closing.

E. Door Hardware: Stainless steel, manufacturer's standard finish.
   1. Door Latch: Slide type with exterior emergency access feature.
   2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
   3. Provide door pull for outswinging doors.

F. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch (6 mm).

B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 21 23
CUBICLE CURTAINS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The fabrication, furnishing, delivery, and installation of cubicle curtains.

B. The work of this section shall include, but not necessarily be limited to the following:
   1. Cubicle curtains in Nursing Classroom

1.02 GENERAL REQUIREMENTS

A. Field Conditions: All bidders shall fully inform themselves of the conditions under which the work is to be performed. No additional compensation shall be allowed for any labor or item the bidder could have been fully informed of prior to the bid date

1.03 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed installation of curtains 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. Fire-Test-Response Characteristics: Provide curtains with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or a testing and inspecting agency acceptable to authorities having jurisdiction. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant, or treated with flame-retardant chemicals, and whether it will require retreatment after designated time period or cleaning.
   1. Flame resistance ratings : passes NFPA 701

C. Cubicle curtains: Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.04 SUBMISSIONS

A. Drawings: Submit component and installation drawings and schedules showing all information necessary to fully explain the features, appearance, function, fabrication and installation.

B. Curtain Samples for Initial Selection: Manufacturer's color charts showing the full range of colors, textures, and patterns available, together with 12-inch- square sample (any color) of each type fabric.

C. Product Certificates: Signed by manufacturers of curtains certifying that products furnished comply with requirements. Give name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.
   1. Schedule: Prior to the commencement of the installation work, the Contractor shall submit an outline of the proposed schedule and requirements for approval.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify curtain openings and dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work

PART 2 - PRODUCTS

2.01 CUBICLE CURTAINS AND TRACK.

A. Approved manufacturers: Interspec; Architex; Carnegie

B. Curtains:
   1. Fabric: 100% flame retardant polyester.
   2. Width: Equal to respective track length, plus minimum 20 % fullness.
   3. Length: equal to floor to ceiling length, with 20 " heading mesh, minus 10" (above floor)
   4. Mesh shall be serged to face fabric, turned and stitched with double needle lock stitch no less than 1/2 " in width.
   5. Bottom and side hems: Fabric is double folded 1 1/2" and sewn with double needle lock stitch.
   6. Vertical Seams: Seams are serged together and sewn with double needle lock stitch minimum ½" wide.
   7. Heading mesh: Provide 20" mesh, no snag, tightly woven selvedge, minimum 70% open, ½" diagonal; with 1.25 " grommet band at top edge. Color : Beige.
   8. Curtain grommets: #2 two rolled-edge, rust proof, nickel plated brass, spaced no more than 6" o/c. and machined into top header.
   9. Track:
      a. Extruded Aluminum track : 1 3/8" wide x ¾" high.
      b. Curve track: factory fabricated as required.
      c. Finish: white, baked enamel.
   10. Track accessories.
      a. Provide all required accessories to match track. End stops - removable.
      b. Fasteners: stainless steel.
   11. Curtain carriers.
      a. Two nylon rollers, nylon axle, and tangle free nylon swivel stem with chrome plated steel hook.

PART 3 - EXECUTION

3.01 INSTALLATION – CUBICLE CURTAINS

A. Install tracks level and plumb per manufacture's instructions.

B. Type: surface mounted on ceiling grid.

C. Provide adequate carriers for installation, plus 10% extra as attic stock.

3.02 LOCATION

A. Nursing Classroom

3.03 CLEAN UP

A. The Contractor shall be responsible for clean up, including removal of packing materials etc. and the protection of surfaces or equipment provided by other contractors.
   1. Manuals and instruction in the care and maintenance of curtains shall be provided in accordance with Part 1 of this Specification.

END OF SECTION

SECTION 10 22 39
FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Top-supported operable panel partitions, vertical opening, electrical operation.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking and track support shimming.

B. Section 06 20 00 - Finish Carpentry: Product requirements for plastic laminate finish for installation by this section.

C. Section 10 11 01 - Visual Display Boards and Display Cases: Product requirements for markerboard finish for installation by this section.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

D. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions; 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.

C. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.

D. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.

E. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

F. Samples for Review: Submit two samples of surface finish, 12 by 12 inches (300 by 300 mm) size, illustrating quality, colors selected, texture, and weight.

G. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.

H. Manufacturer's Instructions: Indicate special procedures.

I. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within five year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Operable Panel Partitions - Vertical Opening:
   1. Skyfold.

2.02 OPERABLE PANEL PARTITIONS - VERTICAL OPENING

A. Operable Panel Partition: Vertical opening; individual panels stacked in drive box above ceiling; motor operated.

B. Panel Construction:

C. Panel Finishes:

D. Panel Seals:
   1. Panel to Panel Seals: Tongue and groove configuration, color to match panel finish.

E. Suspension System:
   1. Guide Rails: Extruded aluminum; 6 inches (152 mm) wide and 6 inches (152 mm) deep.
   2. Guide Rollers: Sealed rollers with hardened steel ball bearings.
   3. Drive Box: Hardened steel construction.
      a. Supports weight of panels in stacked position.

F. Performance:
   1. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

G. Operation:
   1. Electric Operator: 5 to 10 feet per minute (1-1/2 to 3 meters per minute) vertical traveling speed.
      a. Drive system includes drive shafts, couplers, torque limiter, key pressure actuation control station wired in series, dual drive emergency operation and all necessary equipment for electric operation.
      b. Chain drive attaches to dual direction lead panel.
   2. Control Station: One standard keyed switch (RESET-OFF-ON) and one two-position (OPEN-CLOSE, constant pressure) type rocker switch; 24 volt circuit; surface mounted.
      a. Master key switch prepared for mortise lock cylinder.
      b. Option: Additional push button switch located at opposite end of partition for full view of opening on both sides during operation. This option requires two people to operate partition: One presses rocker switch while second person simultaneously presses push button.
      c. Key switches alike.

3. Safety Features:
   a. Load Arrestor: Stops free fall occurrence.
   b. Entrapment Backup System: Automatically reverses downward movement when lead edge makes contact with obstruction within path of travel.
   c. Limit Switches: Automatic type, at both extremes of travel, to prevent over-travel.
   d. Emergency Release: Mechanism to disengage motor drive system and permit manual operation.
4. Electrical Requirements:
5. Operation Sequence:
   a. Stack/Store Panels: Panels are retracted above ceiling and stored by activating key-switch control.
   b. Extend Partition: When operable wall is being lowered (closed), panels stop and retract if leading (bottom) edge comes in contact with any object between it and floor. Operation of wall may resume once key switch has been reset and obstruction cleared.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Standard Gypsum Board: ASTM C1396/C1396M, 3/8 inch (9.5 mm) thick, maximum permissible length; ends square cut, square edges.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.

B. Install acoustic sealant to achieve required acoustic performance.

C. Coordinate electrical connections.

3.02 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C. Adjust partition assembly to achieve lightproof seal.

3.03 CLEANING

A. Clean finish surfaces and partition accessories.

3.04 CLOSEOUT ACTIVITIES

A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 10 23 10
GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Frameless glazed interior wall and door assemblies.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each component in partition assembly.

C. Shop Drawings: Drawings showing layout, dimensions, identification of components, and interface with adjacent construction.
   1. Include field measurements of openings.
   2. Include Elevations Showing:
      a. Locations and identification of manufacturer-supplied door hardware and fittings.
      b. Locations and sizes of cut-outs and drilled holes for other door hardware.
   3. Include Details Showing:
      a. Requirements for support and bracing of overhead track.
      b. Installation details.
      c. Appearance of manufacturer-supplied door hardware and fittings.

D. Selection Samples: Two sets, representing manufacturer's full range of available metal materials and finishes.

E. Verification Samples: Two samples, minimum size of 2 inch by 3 inch (51 mm by 76 mm), representing actual material and finish of exposed metal.

F. Certificates: Contractor to certify that installer of partition assemblies meets specified qualifications.

G. Operation and Maintenance Data: For manufacturer-supplied operating hardware.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

I. Specimen Warranty.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Minimum three years of experience designing, assembling, and installing partition assemblies similar to those specified in this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against excessive degradation of metal finishes. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 FRAMELESS GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

A. Frameless Glazed Interior Wall Assembly: Factory fabricated assemblies consisting of full-width and height glass panels fastened with U-channel fittings on top and bottom edge of glass wall.
   1. Configuration: As indicated on drawings.
   2. U-Channel Fittings: Extruded aluminum, satin anodized finish, dry glazed, and with matching end caps.
      a. Top channel and Door Head: Kawneer 450 framing, 1-3/4 inch high by 4-1/2 inch deep.
      b. Bottom channel is 1 inch (25.4 mm) high by 1 inch (25.4 mm) deep.
   3. Glass Thickness: 1/2 inch (12.7 mm), tempered.
   4. Designed to withstand normal operation without damage, racking, sagging, or deflection.
   5. Coordinate wall and door assembly preparation and provide hardware as necessary for fully operable installation.
   6. Finished metal surfaces protected with strippable film.
   7. Factory assembled to greatest extent practical; may be disassembled to accommodate shipping constraints.

B. Pivoting Glass Doors: Dry glazed patch fittings.
   1. Door Configuration: As indicated on drawings.
   2. Height: 2 inch (51 mm).
   3. Length: 6-7/16 inch (164 mm).
   4. Cladding Finish: Satin anodized.
   5. Glass Thickness: 1/2 inch (12.7 mm), tempered.
   6. Door Hardware: Salto XS4 lockset, brushed stainless steel.
   7. Provide accessories as required for complete installation.
   8. Basis of Design: C.R. Laurence Company, Inc; CRL Commercial Patch Hardware, Catalog No. PH20AA (Top), PH10CA (Bottom): www.crl-arch.com/#sle.

2.02 FITTINGS AND HARDWARE

A. Overhead Concealed Closers and Bottom Pivots: Non-handed closer for both single and double-acting doors with mechanical backcheck, and meeting requirements of BHMA A156.4, Grade 1.
   1. Application: Center hung, with swing as indicated on drawings.
   2. Hold Open: Fixed.
   3. Opening Force: Comply with requirements of authorities having jurisdiction.
   4. Door Weight: Maximum 200 lbs (91 kgs) for exterior doors, and 250 lbs (113 kgs) for interior doors, including hardware.
   5. Provide accessories as required for complete installation, including wall/floor stop.

6. Manufacturers:
   a. CRL Overhead Concealed Door Closer for Patch Fittings.

2.03 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify floor flatness of 1/8 inch in 10 feet (3 mm in 3 m), non-cumulative.

C. Do not begin installation until supports and adjacent substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Prepare substrates using the methods recommended by the manufacturer for achieving acceptable result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with glazed interior wall and door assembly manufacturer's instructions.

B. Fit and align glazed interior wall and door assembly level and plumb.

3.04 ADJUSTING

A. Adjust glazed interior wall and door assembly to operate smoothly from pivoting positions.

B. Adjust swing door hardware for smooth operation.

3.05 CLEANING

A. Clean installed work to pristine condition.

3.06 CLOSEOUT ACTIVITIES

A. Demonstrate operation of glazed interior wall and door assembly and identify potential operational problems.

3.07 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Protective wall covering.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

1. Submit two samples of protective wall covering and door surface protection, 6 by 6 inches (152 by 152 mm) square.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PRODUCT TYPES

A. Protective Wall Covering:

1. Material: High-impact acrylic-modified vinyl.
2. Thickness: 0.040 inch (1.02 mm).
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Color: As selected from manufacturer's standard colors.

2.02 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.

1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position protective wall covering no less than 1 inch (25.4 mm) above finished floor to allow for floor level variation.

1. Apply adhesive with 1/8 inch (3.2 mm) V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch (6 mm).

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch (6 mm).

3.04 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 28 00
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Electric hand dryers.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.

B. Section 10 21 13.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM C1036 - Standard Specification for Flat Glass; 2011.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products listed are made by Bobrick Washroom Equipment, Inc., www.bobrick.com.

B. Other Approved Manufacturers for Commercial Toilet Accessories:
   1. Bradley Corporation: www.bradleycorp.com.
   2. Substitutions: Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

G. Adhesive: Two component epoxy type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 TOILET ACCESSORIES

A. Item A: Mirrors: Stainless steel framed, 6 mm thick laminated glass mirror.
   1. Product: Bobrick B-290 series, manufactured by Bobrick.
   2. Size: As shown.
   3. Frame: 0.05 inch (1.3 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.

B. Item B: Toilet Paper Dispenser: Triple roll, surface mounted, for coreless type rolls; provided by vendor, installed by contractor.
   1. Products:
      a. Hillyard Product No. PAP42527.

C. Item D: Roll Towel Dispenser: Single roll, surface mounted bracket type, black translucent plastic cover; provided by vendor, installed by contractor.
   1. Products:
      a. Hillyard Product No. PAP42819.

D. Item E: Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
   1. Product: B-270 manufactured by Bobrick.

E. Item F: Soap Dispenser: Manual soap dispenser, wall-mounted, surface, with black plastic cover and vertical tank and working parts; push type soap valve, check valve, and window gage refill indicator.
   1. Products:
      a. Hillyard Product No. HIL22281.
   2. Provided by vendor, installed by Contractor.

F. Item G: Grab Bars: Stainless steel, 1-1/4 inches (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches (38 mm) clearance between wall and inside of grab bar.
   1. Product: B-5806.99 series manufactured by Bobrick.
   2. Length and configuration: As indicated on drawings.

G. Item H: Electric Hand Dryer:
   1. Product: XLerator Automatic Hand Dryer.
      a. Model: XL-W: Surface mounted with white metal cover.
      b. Electrical: 120v. 60 Hz.
      c. Cover: Die-cast zinc alloy; One-piece, heavy-duty, rib-reinforced, lightweight, unbreakable, rustproof; all exposed surfaces shall be bright chrome plated or finished with chip-proof, electrostatically applied epoxy paint.
      d. Provide stainless steel ADA recess kit

e. Provide noise reduction nozzle

2. Stainless Steel Backsplash: Provide stainless steel sheet behind electric hand dryer, extending from top of hand dryer to top of wall base, 16 inches wide, with hemmed edges and conccealed fasteners.

H. Item I: Waste Receptacle: Wall-mounted, stainless steel, continuously welded bottom pan, seamless exposed flanges, and hemmed top edge.

1. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of 4 points with stainless steel grommets and hooks.
2. Minimum capacity: 12 3/4 gallons (____ liters).
3. Product: B-277 manufactured by Bobrick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 21 1200 - Fire-Suppression Standpipes: Cabinet enclosure for extinguishers.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

B. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

A. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

B. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers, Fire Extinguisher Cabinets and Accessories:
1. JL Industries, Inc: www.jlindustries.com.
2. Larsen's Manufacturing Co: www.larsensmfg.com.
3. Potter-Roemer: www.potterroemer.com.
4. Elkhart.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Dry Chemical Type Fire Extinguishers: Cast steel tank, with pressure gage.
1. Class ABC.
2. Size 10 pound multi-purpose.
3. Finish: Baked enamel, color as selected..
4. Provide one 10 lb. Dry Chemical Type Fire Extinquisher in recessed cabinet every 75 feet in corridors.

C. K Type Extinguiser: Provide Wet Chemical (WC- 6L) Class K fire extinguishers with standard bracket in kitchen. (Maximum travel distance from cooking fire hazard to extinguisher = 30')

1. Provide three (3) K Type Extinguishers (min).
2. Approved manufacturers: JL Industries, Larsen's, or Elkhart.

2.03 FIRE EXTINGUISHER CABINETS

A. Metal: Formed primed steel sheet.

B. Cabinet Configuration: Recessed.
1. Size to accommodate accessories.
2. Exterior nominal dimensions of 12 inch wide x 27 inch high x 8 inch deep.
3. Trim: Flat.
4. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

C. Door: 1/2 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge.

D. Door Style and lock: Recess mounted, vertical duo style, 18 gauge pressed steel construction with Duo-Panel doors and emergency safety locks (such as Larsen-Loc/Saf-T-lok).

E. Verify that cabinets are sized to accommodate extinguishers.

F. Door Glazing: Float glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

G. Lettering: Vertical, die cut, red.

H. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

I. Weld, fill, and grind components smooth.

J. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

K. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

2.05 ADDITIONAL EQUIPMENT

A. Provide 4 Dry Chemical Type fire extinguishers and brackets in addition to those shown on contract documents.

2.06 FIRE BLANKET CABINET

A. Fire Blanket Cabinet:
1. Dimensions: 24 x 11 x 6 inches
2. Material and finish: 22 ga. steel; red powdercoat finish
3. Lettering on cabinet: white; “FIRE BLANKET”

B. Fire Blanket: 62 x 80 inches, 70% wool, meeting the Flammable Fabrics Act: Flammability of Clothing Textiles, Title 16, CFR1610

C. Manufacturers:
1. Windy City Cabinet: www.windycitycabinet.com <http://www.windycitycabinet.com>
2. Other manufacturers listed in Article 2.01.

2.07 OTHER EQUIPMENT

A. AED Cabinets: Philips Model PFE7024D
1. Surface-Mount with Audible Alarm and Strobe Light
2. Provide flexible 3D wall sign

B. Quantity: 6

C. Epinephrine Cabinet/AED Combo: MacGill Model 16284
   1. Surface-mounted non-locking cabinet with door siren
   2. Provide 3D wall sign
   3. Quantity: 3

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

END OF SECTION

SECTION 10 73 16
ALUMINUM CANOPY SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building supported metal awnings including framing, enclosure, and attachment hardware.

1.02 RELATED SECTIONS

A. Section 05 12 16 - Fabricated Fireproofed Steel Columns.

B. Section 05 40 00 - Cold-Formed Metal Framing.

C. Section 06 10 00 - Rough Carpentry.

D. Section 07 62 00 - Sheet Metal Flashing and Trim.

E. Section 07 71 23 - Manufactured Gutters and Downspouts.

F. Section 07 90 00 - Joint Protection.

G. Section 08 44 23 - Structural Sealant Glazed Curtain Wall.

1.03 REFERENCES

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

C. ASTM B 429 - Standard Specification for Aluminum-Alloy Extruded Pipe and Tube.

D. Aluminum Association AA DAF 45 - Designation System for Aluminum Finishes.

E. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Architectural Extrusions and Panels.

F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels.

1.04 DESIGN REQUIREMENTS

A. Design members to withstand dead, live, wind and other applicable loads in accordance with ASCE-7 and applicable code.

B. Cooperate with regulatory agency or authority and provide data as requested authority having jurisdiction.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

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

C. Shop Drawings: Indicate system components, dimensions, attachments, and accessories

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

E. Verification Samples: For each finish product specified, two samples, minimum size 3 inches (76 mm) square, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic checking and adjustment of cable tension and periodic cleaning and maintenance of all railing and infill components.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and approved by manufacturer.

C. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

D. Welder Qualifications: All welders must be AWS certified welders.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products with labels intact, in manufacturer's unopened packaging until ready for installation.

B. Handle materials so as to protect materials, coatings, and finishes during transportation and installation to prevent damage or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: MASA Architectural Canopies, which is located at: 250 Stelton Rd. Suite 1; Piscataway, NJ 08854; Tel: 732-453-6120; Fax: 732-453-6126; Email: request info (mbradley@architecturalcanopies.com); Web: www.architecturalcanopies.com <http://www.architecturalcanopies.com>

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

2.02 EXTERIOR CANOPY SYSTEM

A. Building Supported Metal Awnings: MASA Architectural Canopies Alumiframe System is a building supported metal awning system provided with framing, enclosure, and attachment hardware.
   1. Materials:
      a. Aluminum Extrusions: ASTM B 221 and ASTM B 429 6061-T6 alloy and temper.
      b. Fasteners: Stainless steel or hot dip galvanized for corrosion resistance.
   2. Shape
      a. Custom as indicated on the Drawings.
   3. Enclosure Material:
      a. Aluminum Composite material.
      b. Standing Seam Metal Roofing.
   4. Support:
      a. Attached to building.
   5. Ceiling Material:
      a. Weatherproof Ceiling panels.
   6. Open Lighting:
      a. Recessed incandescent lighting.
      b. Florescent Tube.

7. Framing: Extruded aluminum square tube.
   a. 1 inch (25.5 mm) square.
   b. 2 inch (51 mm) Square.
   c. 3 inch (76 mm) Square.
8. Decking: Prefabricated interlocking aluminum decking.
   a. Extruded Aluminum Flat soffit decking.
   b. Extruded Aluminum Capped 3 inch by 6 inch by .078 inch (76 mm by 152 mm by 2 mm).
   c. Role Formed Aluminum Thin Profile 1-1/8 inch.
   d. Standard Role Formed Aluminum Profile.
9. Accessories:
   a. Anchors and Fasteners: Stainless steel or hot dip galvanized and corrosion resistant.
10. Finish:
   a. Composite Panels, Fascia and Flashings:
      1) Clear Anodized.
      2) Powdercoat White.
      3) Custom polyurethane color as selected by the Architect.
   b. Framing:
      1) Clear Anodized.
      2) Powdercoat White.
      3) Custom polyurethane color as selected by the Architect.

2.03 FABRLCATLON

A. Fabricate system in accordance with approved Shop Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Field verifies dimensions of supporting structure and any openings at site of installation prior to fabrication

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, in proper plane, free from warp and twist.

C. Anchor system to building components; provide adequate clearance for movement caused by thermal expansion and contraction and wind loads.

3.04 CLEANING

A. Clean all surfaces and restore any marred or abraded surfaces to original conditions as approved by the Architect.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 11 31 00
RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Electric Ranges
   2. Microwave Ovens
      a. Refrigerator/Freezers 4. Dishwasher
      b. Washing Machines 6. Clothes Dryers

B. Related Sections include the following:

C. 1. Division 01 Section "Construction Waste Management" 2. Division 01 Section "Sustainable Design Requirements"

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.

B. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.

C. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified manufacturer.

B. Product Certificates: For each type of appliance, from manufacturer.

C. Field quality-control reports.

D. Warranties: Sample of special warranties.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintains, within 25 Miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

B. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.

C. Source Limitations: Obtain residential appliances from single source and each type of residential appliance from single manufacturer.

D. Regulatory Requirements: Comply with the following:
   1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.

E. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with ICC/ANSI A117.1.

F. Preinstallation Conference: Conduct conference at Project site.

1.07 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period except as qualified below:
   1. Warranty Period: Five years from date of Substantial Completion.

B. Electric Range: Limited warranty including parts and labor for first year.
   1. Warranty Period: One year from date of Substantial Completion.

C. Microwave Oven: Limited warranty including parts and labor for first year.
   1. Warranty Period: One year from date of Substantial Completion.

D. Refrigerator/Freezer, Sealed System: Limited warranty including parts and labor for first year.
   1. Warranty Period: One year from date of Substantial Completion.

E. Dishwasher: Limited warranty including parts and labor for first year.
   1. Warranty Period: One year from date of Substantial Completion.

F. Clothes Washer: Limited warranty including parts and labor for first year.
   1. Warranty Period: One year from date of Substantial Completion.

G. Clothes Dryer: Limited warranty including parts and labor for first year.
   1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ELECTRIC RANGES (ADA COMPLIANT)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Kenmore Model # 42531, Basis of Design or approved equal 2. LG Appliances. <http://www.specagent.com/LookUp/?uid=123456794758&mf=&src=wd>
   2. Samsung. <http://www.specagent.com/LookUp/?uid=123456794761&mf=&src=wd>
   3. Whirlpool Corporation. <http://www.specagent.com/LookUp/?uid=123456794767&mf=&src=wd>

B. Slide-in range with one oven and complying with AHAM ER-1. 1. Width: 31 1/2 inches .
   1. Electric Burner Elements: Four.
      a. Coil Type: Manufacturer's standard Two 2600 W and two 1500 W. b. Cooking Surface: Electric radiant glass surface.
      b. Controls: Electro mechanical, located on front.
      c. Oven Features:
         1) Capacity: 4.6 cu. ft..
         2) Operation: Baking and self-cleaning. c. Broiler: Located in top of oven.
         3) Oven Door(s): Counterbalanced, removable, with observation window and handle. e. Electric Power Rating:
         4) Oven(s): Manufacturer's standard. 2) Broiler: Manufacturer's standard.
         5) Controls: Electro-Mechanical, located on front.
         6) Anti-Tip Device: Manufacturer's standard.
         7) Electric Power Supply: 240 V, 60 Hz, 1 phase, 30 A. 6. Material: Manufacturer's standard cooktop.
            (a) Color/Finish: White.

2.02 COUNTER-TOP MICROWAVE OVEN (ADA COMPLIANT)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Kenmore Model # P90D23AP-WJW 73772, Basis of Design or approved equal 2. LG Appliances. <http://www.specagent.com/LookUp/?uid=123456794818&mf=&src=wd>
   2. Samsung. <http://www.specagent.com/LookUp/?uid=123456794822&mf=&src=wd>
   3. Whirlpool Corporation. <http://www.specagent.com/LookUp/?uid=123456794827&mf=&src=wd>

B. Microwave Oven with the following features: 1. Mounting: Counter-top
   1. Type: Conventional. 3.Dimensions:
      a. Width: 29.875 inches. b. Depth: 15.25 inches
      b. Height: 16.406 inches
      c. Capacity: 0.9 cu. ft..
         1) Oven Door: Door with observation window and pull to open release. 6. Microwave Power Rating: 900 W.
         2) Electric Power Supply: 120 V, 60 Hz, 1 phase, 15 A. 8. Controls: Digital panel controls and timer display.
         3) Material: Manufacturer's standard.
            (a) Color/Finish: White.

2.03 REFRIGERATOR/FREEZERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Kenmore Model 69312, Basis of Design, or approved equal 2. LG Appliances. <http://www.specagent.com/LookUp/?uid=123456794877&mf=&src=wd>
   2. Samsung. <http://www.specagent.com/LookUp/?uid=123456794880&mf=&src=wd>
   3. Whirlpool Corporation. <http://www.specagent.com/LookUp/?uid=123456794890&mf=&src=wd>

B. Refrigerator/Freezer Two-door refrigerator/freezer with freezer on bottom, adjustable legs and complying with AHAM HRF-1.
   1. Type: Freestanding. 2. Dimensions:
      a. Width: 29.63 inches. b. Depth: 33.38 inches. c. Height: 66.94 inches.
         1) Storage Capacity:
            (a) Refrigeration Compartment Volume: 12.94 cu. ft.. b. Freezer Volume: 5.73 cu. ft. .
            (b) Shelf Area: Three wire shelves
      b. Refrigerator Features:
         1) Interior light in refrigeration compartment.
         2) Compartment Storage: vegetable crisper and meat compartment.
            (a) Door Storage: Modular compartments Gallon (3.8 L-)milk-container storage, 3 shelves
            (b) Defrost system: Frost free. e. Reversible door.
         3) Freezer Features: One freezer compartment with door
            (a) Automatic defrost.
         4) Front Panel(s): Manufacturer's standard.
            (a) Panel Color: White.
         5) Appliance Color/Finish: White.

2.04 DISHWASHERS (ADA COMPLIANT)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Kenmo <http://www.specagent.com/LookUp/?uid=123456794944&mf=&src=wd>re, Model 12332, Basis of Design or approved equal 2. LG Appliances. <http://www.specagent.com/LookUp/?uid=123456794950&mf=&src=wd>
   2. Whirlpool Corporation. <http://www.specagent.com/LookUp/?uid=123456794958&mf=&src=wd>

B. Dishwasher Complying with AHAM DW-1 and ASSE 1006. 1. Type: Built-in undercounter.
   1. Dimensions:
   2. a. Width: 24 inches b. Depth: 23 inches.
      a. Height: 32.5 - 35 inches.
         1) Capacity:
            (a) International Place Settings of China: 12
         2) Sound Level: Maximum 56 dB.
         3) Tub and Door Liner: Manufacturer's standard with sealed detergent and automatic rinsing-aid dispensers.
         4) Rack System: Nylon sliding dish racks, with removable cutlery basket. 7. Controls: Electronic, fully visible
         5) Wash Cycles: Five 9. Features:
            (a) Waste food disposer. b. Heated Drying
            (b) Removable Racks d. Cup Shelf
            (c) Self Cleaning Filter
         6) Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
         7) Front Panel: Manufacturer's standard.
         8) Appliance Color/Finish: White.

2.05 CLOTHES WASHERS AND DRYERS (ADA COMPLIANT)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Whirlpool.
      a. Washer: Whirlpool Model 41122, Basis of Design or approved equal b. Dryer: Whirlpool Model 81122, Basis of Design or Approved equal
   2. Samsung. <http://www.specagent.com/LookUp/?uid=123456794972&mf=&src=wd>
   3. GE Corporation. <http://www.specagent.com/LookUp/?uid=123456794979&mf=&src=wd>

B. Clothes Washer Complying with ASSE 1007. 1. Type: Freestanding, front-loading unit. 2. Dimensions:
   1. Width: 27 inches b. Depth: 31.3 inches c. Height: 36 inches
   2. Drum: Manufacturer's standard.
      a. Capacity: 3.9 cu. ft.
   3. Controls: Electromechanical
      a. Wash Cycles: 14 wash cycles .
      b. Wash/Rinse Temperatures: 5 settings.
   4. Electrical Power: 120 V, 60 Hz, 10 A. 6. Motor Speeds: Variable
   5. Features:

a. Unbalanced-load compensator.
b. Inlet Hoses: Minimum length 60 inches (1525 mm). c. Drain Hoses: Minimum length 48 inches (1220 mm). d. Self-leveling legs.
c. Automatic dispenser for bleach and fabric softener.
d. Spin-cycle safety switch. g. End-of-cycle signal.
e. Extra-rinse option.
f. i. Electronic temperature control. j. Water levels automatically set.

6. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
7. Appliance Finish: Porcelain enamel on top and lid; baked enamel on front and sides.
   a. Color: White.
8. Front-Panel Finish: Manufacturer's standard.
   a. Panel Color: White.

C. Clothes Dryer Complying with AHAM HLD-1.
1. Type: Freestanding, frontloading, electric unit. 2. Dimensions:
   a. Width: 27 inches. b. Depth: 30.3 inches c. Height: 36 inches.
2. Drum: Manufacturer's standard.
   a. Capacity: 7.0 cu. ft. (0.20 cu. m).
3. Controls: Rotary - electronic with LED's 5. Electric-Dryer Amperage: 30 Amps
4. Features:
   a. Removable lint filter. b. End-of-cycle signal. c. Self-leveling legs.
   b. 6 cycles.
   c. Built-in electrical power fuse.
5. Appliance Finish: Porcelain enamel on top and lid; baked enamel on front and sides.
   a. Color: White.
6. Front-Panel Finish: Manufacturer's standard.
   a. Panel Color: White.

2.06 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 CONSTRUCTION WASTE MANAGEMENT (LEED)

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.02 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

C. Examine walls, ceilings, and cabinets for suitable conditions where overhead Microwave will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.03 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

E. Utilities: Comply with plumbing and electrical requirements.

3.04 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
   2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist. 3. Operational Test: After installation, start units to confirm proper operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

C. An appliance will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION

SECTION 11 40 00
FOODSERVICE EQUIPMENT

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. Provide all material, labor, equipment and services required to execute and complete all items of work relating to the food service equipment, both existing and new, all as required to make the resulting facility a fully functional and reliable operating unit in accordance with this Specification. All food service equipment shall be furnished as specified, delivered prepaid, unloaded and uncrated, assembled with all components and accessories connected within the equipment, set-in-place in proper location as indicated on the drawings, leveled and fastened to the wall, ceiling or floor as required, left ready for final utility connections. The work shall include:

1. To prevent extended warehousing of all food service equipment, no pre-ordering of equipment is permitted; schedule ordering of the equipment so that warehousing of the equipment shall not be required for longer than 60 days prior to delivery to the site for installation.
2. All food service equipment shall have a manufacturer extended warranty covering parts and labor for a period of two years which shall take effect only after acceptance and beneficial use by the District. All labor shall be performed by a factory authorized and qualified representative.
3. A “complete and thorough” demonstration and start-up for each item of equipment must be conducted by a qualified manufacturer representative in the use, sanitation and maintenance of the equipment.

B. Furnishing scheduled items of custom fabricated food service equipment as specified utilizing a food service equipment fabricator listed with the National Sanitation Foundation (NSF) for custom equipment fabrication.

C. Delivery of food service equipment in factory fabricated containers designed to protect equipment and finish until final installation. Delivery of food service equipment shall be coordinated with the construction schedule. If necessary, delivery of the food service equipment shall be by means other than common carrier to expedite delivery and to maintain project schedule.

D. Warehousing of the food service equipment in a bonded warehouse and re-delivery of the food service equipment from the storage facility to the project site or arrangement for secured storage

at the project site to assure availability of the food service equipment to maintain project schedule.

E. Field installation of the food service equipment including buy out equipment at the project site including on site receiving and unloading, uncrating from packing containers, conveyance of the food service equipment from the receiving area to the installation location, erection and assembly of the food service equipment including field welding and polishing of sub assemblies and installation of fixtures and components and setting in place in final location.

F. Removal and disposal of discontinued items of food service equipment not to be reused including costs for transport and scrapping. This shall include pump-down and reclaim of refrigerant and fire system propellant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.

G. Removal and disposal of discontinued items of food service equipment not to be reused including costs for transport and scrapping. This shall include pump-down and reclaim of refrigerant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.

H. Removal, cleaning, servicing, reassemble and reinstallation of items of food service equipment to be reused including warehousing and transportation costs for scheduled items of food service equipment to be refurbished off-site or to be temporarily stored off-site. This shall include pump-down and reclaim of refrigerant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of discontinued services and modification or preparation or relocated utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.

I. Removal, cleaning, servicing, crating and delivery including costs for transport of items of food service equipment to be reused in an alternate location. This shall include pump-down and reclaim of refrigerant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.

J. Removal and disposal of all packing material.

K. All costs for special tools, crane rental or usage cost or rigging as may be required for delivery or installation of the food service equipment.

L. All work is to be performed by skilled labor utilizing the proper Trades having respective jurisdiction thereto. All work shall be performed at hours required to maintain consistent work schedules with all other Trades without additional cost.

M. Preparation of dimensioned utility rough-in floor plans coordinated with the Contract Documents and site conditions and the food service equipment manufacturers' utility connection points for all food service equipment.

N. Assist in the preparation of "chalk-line" mark-up of utility rough-in locations on the building floor at the job site.

O. Take complete financial responsibility for any and all additional expenses resulting from incomplete or inaccurate rough-in drawings or instructions for the final rough-in dimensioning at the job site.

P. Provide complete manufacturers' and fabricator shop drawings of all related items of food service equipment.

Q. Provide competent on site supervision for the coordination of work and to assist and supervise the erection, assembly and installation of the food service equipment, this shall include any moving, shifting or disassembly of the food service equipment to enable work to be performed free of obstruction.

R. Attend all job conferences and meetings.

S. Maintaining coordination and control over the form, fit, function and utility requirements of all food service equipment, from placement of purchase orders through Final Acceptance

T. Provide competent on-site final testing, demonstration and instruction in the use and service of all items of food service equipment in the form of a qualified manufacturer's representative for each item of food service equipment.

U. Providing access to the custom equipment fabricator's shop for inspection of construction and materials used at any time during the progress of fabrication.

V. Field verification of all measurements at the project site prior to the fabrication of custom fabricated and buy-out equipment and correct any deviation from the dimensions indicated on any plans and shop drawing which may affect the final form or fit of any item of food service equipment as a result of final building conditions and actual field dimensions.

W. All food service equipment shall conform to field verified dimensions and to the finished building conditions with edges scribed and sealed to wall surfaces, fitting to and around building obstructions. All joints, seams or surfaces shall be fully sealed with General Electric or equivalent clear silicone sealer.

X. Field verification of delivery access into and through the building to the final equipment location including access and clearance through hallways, doorways and elevators (cab size and weight restrictions); furnish food service equipment in sections or sub-assemblies as required for access.

Y. Keeping the premise free from accumulation of waste material and rubbish caused by his work. At the completion of each workday all waste material and rubbish must be removed and all areas swept broom clean.

Z. Physical damage to equipment, building or previous work completed or in the process of completion shall be repaired or replaced.

AA. Furnish as part of and affixed to the food service equipment, accessories, components and fixtures furnished standard with the equipment as specified or listed as an option and shall include the following:

1. PLUMBING ACCESSORIES: Pop-up, lever or basket type waste outlets, tailpieces, standing or connected overflows, faucets and spray units, vacuum breakers, shut-off and control valves and fittings.
2. STEAM AND GAS ACCESSORIES: Steam supply valves, thermostats, pressure reducing and regulating valves, shut-off and control valves, temperature and pressure gauges, copper steam coils or injector assemblies, traps and fittings
3. ELECTRICAL ACCESSORIES: Terminal blocks, conduit, wiring, signal and pilot lamps, on-off and control switches, control panels, magnetic contactor assemblies, heating elements, junction boxes, outlet boxes and receptacles and cord and plug sets.
4. REFRIGERATION ACCESSORIES: Copper insulated refrigeration tubing, valves, fittings, hangers, high and low pressure control switches, solenoid valves, evaporator coils, expansion valves, condensing units and condensate evaporators.

BB. All built-in accessories, components and fixtures shall be factory installed at the time of fabrication and shall comply with all applicable codes and regulations.

CC. Furnish and install copper insulated refrigeration lines from compressor location to evaporator coils and expansion valves for all refrigeration units and ice makers with remote or refrigeration systems other than self-contained.

DD. Furnish and install flexible stainless steel gas flue tubing from exhaust collar on gas hot water booster heater terminating at the exhaust vent connection at the vent extension or condensate hood.

EE. Furnish 14 gauge galvanized steel welded roof curbs for all refrigeration condensing unit stands and exhaust fans and supply fan make-up air units including setting-in-place and securing to the building roof.

FF. Furnish and install in exhaust hood, plenum, duct and surface fire protection system. Entire system shall be furnished and installed in compliance with UL Standard 1254, UL Standard 300, NFPA 96 and any prevailing statutes or codes including automatic shut-down of all cooking appliances per code section 44 of NFPA 17A-27. The manufacturer of the fire suppression system shall be ISO 9001 registered. The entire installation must conform to ADA (American Disabilities Act) latest edition. The system shall be an automatic fire suppression system using a wet chemical agent for grease related fires. The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by Underwriters Laboratories (UL). The system shall be installed and serviced by certified personnel trained by the manufacturer. Provide as part of fire system, mechanically operated gas supply line shut-off valve to interrupt gas supply to all gas operated cooking appliances. Gas valve shall be provided with manual reset to prevent gas flow to pilot devices on appliances prior to restart.

GG. Furnish and install remote and self-contained refrigeration system complete with Copeland condensing unit and insulated copper refrigeration lines charged with R404A refrigerant. Condensing unit shall be interconnected to a low profile, high velocity evaporator coil. Refrigeration system shall include all fittings, valves, switches, controls and all related components to comprise a complete operating unit of sufficient BTU capacity to maintain automatic operation of 35 degree F product temperature in coolers and -10 degree F product temperature in freezers. Refrigeration system provided with outdoor remote air cooled condensing unit shall be provided with winterized controls (low ambient package) including

crankcase heater, line dryers and head pressure control unless specified as part of a pre-assembled refrigeration rack system. Refrigeration lines to be run within any slab or floor shall be either hard copper or soft copper if run within conduit.

HH. All electrical wiring, plumbing lines, gas lines (except exposed threaded pipe gas manifolds at cooking appliances), steam lines and refrigeration lines shall be concealed in the floor, walls or above the finished ceiling in an acceptable manner and in compliance with all applicable codes. Where it is impractical to run lines within the floor, walls or above the finished ceiling, lines shall be enclosed in a stainless steel (or alternate "smooth and cleanable" approved material) with appropriate access for service or replacement. In situations of an island arrangement or where equipment is not situated with access to a wall surface, lines must be installed in the floor in an approved manner including in-ground conduit for refrigeration and beverage lines. In no case shall any lines be "exposed".

II. Furnish materials and install all interconnecting wiring as required for the food service equipment, this shall include inter-wiring of control panels furnished as a part of a fixture or appliance, on-off switches for light fixtures furnished as a part of a fixture or appliance, inter-wiring of control devices to motors furnished as a part of a fixture or appliance, time clock circuits for freezers from remote condensing unit to evaporator coil, heated pressure relief ports in walk-in freezer, electrical receptacles furnished as a part of a fixture or appliance, light fixtures in exhaust hoods and walk-in refrigeration to on-off switches and conduit junction boxes, ceiling mounted heat lamps to remote wall switch and inter-wiring of food waste disposer from control device to disposer motor as required to complete the installation of the food service equipment.

JJ. Furnish materials and install heat tracing tape to all condensate lines within walk-in freezer; insulate entire heat tracing tape with foam pipe insulation.

KK. Furnish materials and install all interconnecting plumbing as required for the food service equipment, this shall include faucets, drains, drains with connected overflow, shut-off valves, vacuum breakers, flow or pressure control valves, gauges, bleeder tubes, piping from disposer control devise to disposer cone and disposer body inlets and piping for steam operated equipment from boiler take-off valve at steam generator to steam inlet connection at appliance as required to complete the installation of the food service equipment.

LL. Furnish materials and install insulated copper interconnecting piping between the dishmachine and the hot water booster heater, this shall include the installation of pressure and temperature gauges, strainer and shock absorber in the hot water supply line to the booster heater.

MM. Furnish and install water filter assemblies, sized and of the proper type to accommodate the water flow rate and "particulate" requirement of the food service equipment; this shall include all combi and bake ovens, steam cookers, proofing cabinets, ice makers, coffee brewing equipment and soda and beverage dispensing equipment.

NN. Furnish and install copper condensate lines in walk-in refrigeration from evaporator coil to waste receptor.

OO. Furnish and install gas supply shut-off valve at each gas manifold connection and furnish and install flexible gas hose connectors to each shut-off valve and to each cooking appliance.

PP. Furnish materials and install interconnecting chrome plated exposed piping for hose reel and hose bibs including installation of check valves and vacuum breaker in supply line; this shall include chrome plated bleeder outlet if required by local health department regulations or local plumbing codes.

1.3 WORK BY THE ELECTRICAL TRADE

A. Rough-in utility connections including proper voltage, phase and amperage required to satisfactorily operate all items of food service equipment.

B. Final connection of the food service equipment from the rough-in location to the connection point on all food service equipment and necessary connection points.

C. All electrical components for the exhaust and supply ventilation system (including condensate hoods and pant leg vent systems) including, electrical disconnects, starters, exhaust fan on-off switch with indicator lights located in kitchen and supply fan controller with indicator lights located in kitchen and dishroom.

D. Furnishing and installation of all accessories, components and fixtures other than those specified as part of the food service equipment, to include but not be limited to, electrical circuit breakers or fuses, electrical receptacles, disconnect switches, on-off switches or other fittings and appurtenances that are required to connect the food service equipment in accordance with manufacturer's instructions and result in proper operation.

E. Utility disconnection and termination of discontinued services of existing food service equipment to be terminated.

F. Furnishing and installing electrical plug and cord sets where not furnished as part of the appliance.

G. Electrical contractors or shunt-trip circuit breakers to interrupt electrical power to all electrically operated food service cooking appliances.

H. In-floor, flush mounted, waterproof electrical receptacles of type and capacity to match plug and cord sets for all mobile food service counter equipment.

I. Ceiling mounted, retractable drop cords to accommodate food service equipment in an island arrangement, of the type and capacity to match plug and cord sets of the food service appliances.

J. Furnishing materials and installation of all interconnecting wiring as required for the food service exhaust ventilation and fire suppression systems; this shall include wiring of electrically operated gas supply shut-off valves for fire suppression systems, fire suppression system wiring to building fire alarm, heat detector electrical detection device to automatically start supply and exhaust fans and exhaust hood light fixtures to remote wall switch.

1.4 WORK BY THE PLUMBING TRADE

A. Rough-in utility connections including gas, steam, hot and cold water and floor receptors and drains in proper sizes, pressures and quantities required to satisfactorily operate all items of food service equipment.

B. Final connection of the food service equipment from the rough-in location to the connection point on all food service equipment and necessary outlets.

C. Furnishing and installation of all accessories, components and fixtures other than those specified as part of the food service equipment, to include but not be limited to stop cocks, traps, pipe, shut-off valves, pressure reducing valves or other fittings and appurtenances that are required to connect the food service equipment in accordance with manufacturer's instructions and result in proper operation.

D. Furnishing and installing chrome plated indirect waste outlet piping for food service equipment, from the waste outlet connection on the food service equipment to the building waste receptacle (floor sink, etc.).

E. Flushing and sanitizing of lines before making final connections to the food service equipment.

F. Grease interceptors for food service equipment in capacity and size as required by code.

G. Furnish and install exposed threaded gas manifold piping for all cooking appliances and welded in-wall gas manifold piping.

H. Install gas shut-off valve supplied as part of the fire suppression system in the gas supply line in an exposed and accessible location.

1.5 WORK BY THE MECHANICAL TRADE

A. Supply and exhaust ventilation for indoor refrigeration condensing units based on 750 cfm for each air cooled compressor horsepower and 250 cfm for each water cooled compressor horsepower.

B. Exhaust ventilation for condensate applications including fully welded 18 gauge stainless steel or 12 gauge aluminum liquid tight ductwork pitched toward source to prevent leaking, fan and start-sop switch with indicator lights located in the dishroom.

C. Exhaust hood exhaust ventilation system including roof top mounted "utility set" type up-blast centrifugal fan with backward incline wheel, adjustable sheaves, vibration mounts and bird screen at discharge end; fan shall be rated at 14 sones or less and shall be UL 710 listed; roof curb, exhaust ductwork constructed of a minimum 16 gauge galvanized steel or 18 gauge stainless steel, fully welded liquid tight with clean-outs at every major bend and in 20 foot intervals; ductwork shall not exceed a three to one aspect ratio, connection to exhaust fan shall include a UL listed and rated vibration eliminator and ductwork shall be insulated with all prevailing codes.

D. Exhaust hood supply ventilation system including roof top mounted UL listed supply fan with vibration mounts, adjustable sheaves, roof curb, bird screen at intake end, maintainable filtration system, and gas or electric heated supply air heater (supply air heater heat incoming supply air below a 65 degree F ambient temperature) and 22 gauge galvanized steel ductwork.

E. Disconnection and termination of discontinued ductwork of existing exhaust or condensate hoods to be terminated or relocated, and modification or preparation of exhaust system for existing exhaust or condensate hoods to be relocated at the new location.

1.6 WORK BY THE CONSTRUCTION TRADE

A. Masonry bases, floor curbs, structural pads, floor depressions, roof curbs, flues and fireproof duct shafts or enclosures.

B. Conduit for beverage lines (PVC if embedded in concrete or smooth aluminum if exposed) with 24" radius sweep bends and 24" x 24" pull boxes every 100 lineal feet or three turns including sleeves any through walls, floors and ceilings.

C. Sleeves and openings through wall, floors and ceilings for passage of refrigeration lines.

D. Wall blocking or reinforcing to adequately support wall mounted food service equipment or fixtures; provide 3/4" thick exterior grade plywood backing for wood stud applications and 16 gauge steel backing for metal stud applications.

E. Stainless steel or FPR wall paneling behind all mop receptors, dishtables and pot / utensil washing sinks.

F. Installation of floor pans in floor depression with floor pans set flush and finished watertight around entire perimeter at juncture with floor surface.

G. Conduit for refrigeration lines (PVC if embedded in concrete or smooth aluminum if exposed) with 24" radius sweep bends including sleeves any through walls, floors and ceiling.

1.7 WORK BY THE ROOFING TRADE

A. Roof penetrations properly sealed and flashed to prevent water penetration.

1.8 BIDDING INSTRUCTIONS AND QUALIFICATION OF BIDDER

A. The primary items of food service equipment described in this specification are considered the basis of the bid. Only “equal” items listed as part of this specification will be considered and must meet the conditions of the base bid item; this shall include all materials and material finishes, fabrication methods, electrical, plumbing, and mechanical components, electrical control devices, hardware, accessories and options, exactly as specified without exception. It will be the full and complete responsibility of the Food Service Equipment Contractor to pay any and all costs incurred in adapting any other “equal” item to the mechanical, electrical, exhaust ventilation or structural systems of the building including any other cost increase

incurred as a result of engineering changes to the mechanical, electrical, exhaust ventilation, architectural, structural or food service drawings. The contract is to be awarded as follows:

1. The competence and responsibility of the bidder.
2. An itemized cost breakdown of each scheduled item of food service equipment is required, as specified, in order that the District may, at his option, delete any item or supply any portion thereof, or increase the quantity of any item without affecting the cost quoted for the remaining items. "Pre-approved" substituted items must be submitted as an add or deduct alternate in addition to the base bid.
3. The District is not obligated to accept the lowest or any other bid. The award of the contract and choice of the food service equipment Contractor shall be at the District's discretion.

B. Each bidder shall be responsible to visit the project site of the proposed work and fully acquaint himself with conditions as they exist.

C. Each bidder is responsible to attend any pre-bid meeting as required by the District.

D. Each bidder shall be responsible to examine and review the contract document drawings and specifications. Should the bidder find during examination of the drawings and specifications any discrepancies, omissions, ambiguities, or conflicts in or among the contract documents or shall be in doubt as to their meaning, the District shall be notified no later than four working days prior to bid opening for clarification.

E. The failure or omission by any bidder to receive or examine any form, instrument or document or to visit the project site shall in no way relieve him from obligation with respect to his bid. No claims for any extras will be allowed due to unintentional errors, conflicts, or omissions in the contract documents drawings or specifications.

1.9 SUBMITTALS

A. Product Data: For each buy-out item of food service equipment indicated. Include manufacturer's model number and accessories and requirements for access and maintenance clearances, water and drainage, power or fuel and service connections including roughing-in dimensions

B. Shop Drawings: For food service equipment not manufactured as standard production and catalog items by manufacturers. Shop drawings shall include the following information:

1. Dimensioned rough-in plans scaled at 1/4"=1'-0" accurately locating connection points and indicating utility data for all mechanical, electrical and supply and exhaust ventilation requirements.
2. Dimensioned plans scaled at ½"=1'-0" accurately locating and indicating the finished size of masonry bases, floor depressions in structural slabs, stub walls, curbs and finished openings for pass-thru equipment.
3. Dimensioned plans scaled at 1/4"=1'-0" accurately locating conduit and pull boxes for beverage and refrigeration lines including floor, wall and ceiling penetrations and termination points.

4. Dimensioned plans and detailed drawings of all custom fabricated food service equipment scaled at 3/4"-1'-0" for plan and elevation views and 1-½"=1'-0" for sectional views.

C. Copies of original maintenance and repair manuals including a list of all authorized service agencies responsible for each item of food service equipment.

1.10 QUALITY ASSURANCE

A. Manufacturer's qualifications shall include a firm that has regularly engaged in the manufacturing of food service equipment of the same type, capacity, performance and size as specified and whose products have been in similar service for not less than five years.

B. Custom fabricator qualifications for custom food service equipment shall include a skilled sheet metal shop with a minimum of five years' experience in custom sheet metal food service equipment fabrication of similar type as specified. All custom food service equipment shall be fabricated at the same shop.

C. Installer's qualifications shall include a firm with at least three years of successful installation experience on projects with a similar scope to that as required for this project.

D. Food service equipment dealers' qualifications shall include a firm which is regularly engaged in the purchasing of food service equipment as is a manufacturer authorized agent of the specified equipment for not less than five years. The dealer shall also employ a full time project management staff to oversee the purchase of the equipment in compliance with the specifications, coordinate the form and fit of the equipment to the project site conditions, attend all project meetings, coordinate shop drawing review, coordinate installation with the Trades, coordinate factory training and address all issues as they relate to the satisfactory completion of the facility in compliance with the specifications and related documentation.

E. Codes and Standards: All food service equipment furnished and installed under this specification shall be manufactured in strict compliance with the following publications or the current or revised related publication as well as all state, national and local codes and agencies having jurisdiction over same:

1. National Electrical Manufacturer Association NEMA
    a. ICS-77 Industrial Controls and Systems
2. National Electrical Manufacturer Association NEMA
    a. ICS-77 Industrial Controls and Systems
    b. 17.4 Local Application System
    c. 17.13 Water Sprinkler Systems
    d. 96-76 Installation of Equipment for the Removal of Smoke and Grease Laden Vapors for Commercial Cooking Equipment
3. National Sanitation Foundation NSF
    a. 11 76 Food Service Equipment
    b. 4 73 Commercial Cooking and Warming Equipment
    c. C-2-72 Special Equipment and/or Devices
4. National Electrical Manufacturer Association NEMA
    a. 57-78 Electric Lighting Fixtures

b. 197-78 Commercial Electric Cooking Appliances
c. 300 Fire Extinguishing Systems

F. All food service equipment shall be manufactured in strict compliance with standards as set forth by the National Sanitation Foundation (NSF) including fabrication of custom built equipment and shall be listed with same and shall bear their seal. Any item of food service equipment lacking the NSF seal will be rejected.

G. All electrically operated food service equipment shall be constructed in strict compliance with standards as set forth by the Underwriters Laboratories (UL) and shall utilize approved components and assemblies and shall bear the label thereof.

H. Custom fabricated food service equipment shall be constructed to the standards as set forth by the National Association of Food Equipment Manufacturers (NAFEM).

I. All refrigeration equipment and all pressurized vessels shall be constructed, approved, inspected, registered and stamped and installed in strict compliance with the American Society of Mechanical Engineers (ASME), state and local codes for Unfired Pressure Vessels and all other agencies having jurisdiction thereof.

J. All gas operated food service equipment shall be fabricated in strict compliance with standards as set forth by the Underwriter Laboratory (UL) and shall be listed with same and shall bear their seal.

K. Steam operated equipment shall be fabricated and installed in accordance with Pennsylvania Department of Labor and Industry standards.

L. Product Options: Drawings indicate food service equipment based on the specific products indicated. Other manufacturers' equipment with equivalent size and performance characteristics may be considered.

M. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Review methods and procedures related to food service equipment including, but not limited to the following:

1. Review access requirements for equipment delivery.
2. Review equipment storage and security requirements.
3. Inspect and discuss condition of substrate and other preparatory work performed by other Trades.
4. Review structural loading limitations.
5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.

1.11 DELIVERY, STORAGE AND HANDLING

A. Deliver food service equipment as factory-assembled units with protective crating and covering.

B. Store food service equipment in original protective crating and covering and in a dry location.

1.12 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of food service equipment installation areas by field measurements before equipment fabrication and indicate measurements on Shop Drawings and Coordination Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.13 COORDINATION

A. Coordinate equipment layout and installation with other work including light fixtures, HVAC equipment and fire-suppression system components.

B. Coordinate location and requirements of service-utility connections.

C. Coordinate size, location and requirements of concrete bases, positive slopes to drains, floor depressions and insulated floors. Concrete, reinforcement and formwork requirements are specified in Division 3 Section “Cast-in-Place Concrete”.

D. Coordinate installation of roof curbs, equipment supports and roof penetrations, as specified in Division 7 Section “Roof Accessories”.

1.14 WARRANTIES

A. General Warranty: The special warranty specified in this Article shall not deprive the District of other rights the District 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. All buy-out food service equipment herein specified shall have all parts and labor warranted in writing, from the date of Final Acceptance by the District against defective parts, materials, workmanship and design for a period of time as stated within the manufacturers standard published warranty, but no less than two years.

C. All custom fabricated food service equipment shall be warranted as stated above except for a period of two years.

D. Refrigeration equipment shall include start-up and two year parts and labor warranty on the entire refrigeration system and manufacturers five year parts warranty on hermetic scroll and semi-hermetic sealed compressors.

E. Existing equipment refurbished for reuse shall be warranted in writing, against defective parts, materials and labor as stated above but for a period of 90 days.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

A. Stainless steel shall be type 302 or type 304 extra low carbon non-magnetic austenitic 18% chrome, 8% nickel alloy steel. Gauges shall be U.S. Standard of Thickness set forth below:

GAUGE	THICKNESS	GAUGE	THICKNESS
10	.1346	16	.0598
11	.1196	18	.0478
12	.1046	20	.0359
14	.0747	22	.0299

B. All sheets shall be of maximum length to permit fabrication from one sheet. All thickness must meet the above gauge thickness within tolerances set forth by the ANSI after polishing. Finished sheets exceeding these tolerances shall be rejected as not meeting this Specification.

C. Galvanealled steel shall be ARMCO steel or an approved grade of copper bearing steel shall be properly primed, degreased and finished with two coats of synthetic aluminum bronze.

D. Structural steel members used for framing, consisting of angles, bands, bars and channels shall be ductile in quality, free of hard spots, runs, checks, cracks and other surface defects and shall be smooth galvanized by the hot dip process with all surplus removed, free of runs, blisters, excess splatter and uncoated spots or patches.

E. White metal shall consist of corrosion resistant metal containing not less than 21% nickel. All castings shall be rough ground, polished and buffed to a bright luster and shall be free from pit marks, runs, checks, burrs and other imperfections.

F. Stainless steel pipe and tubing shall be seamless or welded of gauge specified and of true roundness. Seamless tubing shall be thoroughly and correctly annealed and ground smooth. Welded tubing shall be thoroughly heat treated and properly quenched to eliminate carbide precipitation, drawn true to size and roundness and polished to match stainless steel sheets.

G. Welding shall be of the electric submerged or concealed arc type, heliarc wherever practical. Where welding rods are required they shall be of the same composition as materials to be joined coated with a non-carbonaceous flux.

H. Plastic Laminate: Complying with NEMA LD 3 and NSF 35 requirements; NSF certified for end-use application indicated; 0.050 inch (1.27 mm) thick, smooth texture and easily cleanable.

1. Color: As selected by Architect from manufacturer’s full range of colors.

I. Plywood and Lumber: Close grain exterior grade mahogany or birch plywood.

J. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Provide elastomeric sealant NSF certified for end-use application indicated. Provide sealant that when cured and washed meets requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food.

1. Color: As selected by Architect from manufacturer's full range of colors.
2. Backer Rod: Closed-cell polyethylene in diameter larger than joint width.

K. Plastic: Except for plastic laminate, provide plastic materials and components complying with NSF 51.

L. Sound Dampening: NSF-certified, non-absorbent, hard drying, sound-deadening coating. Provide coating compounded for permanent adhesion to metal in 1/8-inch (3-mm) thickness that does not chip, flake or blister.

M. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene or PVC that is nontoxic, stable, odorless, nonabsorbent and unaffected by exposure to foods and cleaning compounds.

2.2 ACCESSORIES

A. Cabinet Hardware: Provide NSF-certified stainless steel hardware for equipment items as indicated.

B. Casters: NSF-certified standard-duty stainless-steel swivel stem casters with 5-inch (125-mm) diameter wheels, polyurethane tires with 1-inch (25-mm) tread width and 300-lb (90-kg) load capacity per caster. Provide brakes on 2 casters per unit.

2.3 FABRICATION, GENERAL

A. All welds shall be strong and ductile, nonporous, free of pits and cracks. Parts which are to be welded shall be homogeneous, of a like color and finish to adjoining material. Excess metal and carbide precipitation shall be ground off, finished smooth and polished. Unexposed welds shall be pacified to prevent attrition. Brazed or soldered joints are unacceptable. Where galvanizing has been damaged due to the welding or grinding process, these areas shall be galvawelded to replace finish

B. All exposed surfaces of the food service equipment shall be free from bolts, screws and rivet fastenings. Wherever bolts are required they shall be of similar composition and finish as the metal to which they are applied.

C. Wherever practical all food service equipment and fixtures shall be factory or shop fabricated of one-piece construction, shipped to the project site as one unit completely assembled.

D. Items of food service equipment or fixtures too large to enter or transverse the building to the installation location in one assembly shall be constructed in sections and shall be furnished with field joints. Where field joints are necessary, all adjoining exposed surfaces shall be field welded at the project site as specified above for welding. Where conditions make welded field

joints impractical, each sub-assembly shall be fabricated with off-set draw angles welded to the underside of each adjoining top surface and drawn together to a “hairline” seam with 1/4"-20 stainless steel bolts with lock washers and chrome plated acorn nuts. Bolted field joints will be permitted only where specifically shown on Drawings or specified for a particular item.

E. Wherever shear edges occur they shall be free of burrs, fins or irregular projections and shall be finished to prevent cutting or laceration when the hand is drawn over such shear edges. Brake bends shall be free of undue and where such bends do mar the uniform surface appearance of the material, such marks shall be removed by suitable grinding, polishing and finishing. In no case where miters or bullnose corners occur is overlapping materials acceptable.

2.4 GENERAL FRABRICATION STANDARDS

A. TOPS:

1. Tops shall be fabricated of 14 gauge stainless steel unless otherwise specified. All edges shall be bullnose or formed as specified with all joints butt-edged and electrically welded, ground smooth and polished so no evidence of welding will appear. Soldered corners to achieve round corner construction will not be accepted.
2. Tops adjacent to walls, columns or other equipment shall be turned up integrally into a backsplash as specified. All interior corners shall be coved on a ¾” radius, both horizontally and vertically, forming spherical corners. Ends of backsplashes shall be fully enclosed to the low point of the top edge, fully welded, ground smooth and polished.

B. SUPPORT FRAMING

1. Around the entire perimeter on the underside of all tops and set back 1" from the down-turned edge shall be a fully welded frame assembly fabricated of 1-1/2" x 1-1/2" x 1/8" stainless steel angle iron or material as specified. Provide intermediate cross bracing fabricated of the same material as the angle framing and fully weld to perimeter frame on centers not to exceed 24". Tack weld the entire frame assembly to the underside of the top surface.
2. Open base tables shall be provided with leg mounting channels for weld anchoring leg gussets and shall be fabricated of 1" x 4" x 1" 12 gauge stainless steel or material as specified fully welded at each end of frame and at intervals not to exceed 6'-0".
3. Cabinet base tables and counters shall be provided with triangular corner gusset plates for weld anchoring counter type legs and shall be fabricated of 12 gauge stainless steel fully welded at each corner of table or counter body and at intervals not to exceed 6'-0".
4. Freestanding sinks and Bain Maries shall be provided with triangular corner gusset plates for weld anchoring leg gussets and shall be fabricated of 12 gauge stainless steel, fully welded at each corner of sink or Bain Marie bottom and at intervals not to exceed 6'-0”.

C. LEGS AND ADJUSTABLE BULLET FEET

1. Legs shall be constructed of 1-5/8" diameter 16 gauge stainless steel tubing. Each leg shall be swaged and tapered at the bottom. Fasten each leg to a 3-1/2" high conical shaped die-formed stainless steel gusset equivalent to Component Hardware A20-0206. Provide each leg with stainless steel adjustable foot insert equivalent to Component Hardware A10-0852.

2. Cabinet base tables and counters shall be provided with 6" high conical shaped die-formed stainless steel equipment leg with stainless steel adjustable round foot insert equivalent to Component Hardware A72-0811.

D. CROSSRAILS

1. Provide all open base tables and freestanding sinks and bain Maries with 1-1/4" diameter 16 gauge stainless steel tubular cross railing running between legs at a point 10" above the finished floor. Cross railing shall be continuously welded to legs, filleted, ground smooth and polished to provide a smooth coved radius with leg surface.
2. Where cross railing abuts cabinet base fixtures, cross railing shall be concealed bolt anchored to same utilizing stainless steel hardware.

E. UNDERSHELVES

1. Provide solid fixed undershelf, constructed of 16 gauge stainless steel. Front edge shall be turned down 1" at 90 degrees and returned ½" at 45 degrees. Rear and ends shall be turned up 2" high on a 90 degree angle, interior corners coved on ¾" radius.

F. DRAWERS

1. Provide drawer pan constructed of 14 gauge stainless steel with inside corners coved on a 3/4" radius. Drawer front face shall be double pan type constructed of 16 gauge stainless steel with inner pan set into outer pan and welded in place. Drawer front shall be set into and shall be removable from a 14 gauge stainless steel, channel shaped drawer cradle. Drawer suspension slides shall be secured to drawer frame assembly and shall be Component Hardware S52 series full extension type with 14 gauge stainless steel slides with stainless steel ball bearing wheels having a load capacity of 200 pounds. Provide hard rubber bumper drawer stops. Drawer suspension guides shall be fastened to 18 gauge stainless steel housing which is suspended from the angle framing under the table top. Provide drawer fronts with full grip recessed stainless steel flush pull handles.
2. Stainless steel drawer enclosure cabinet with quantity of drawers as specified with cabinet body fabricated of 18 gauge stainless steel, wrap around construction. The backs of front stiles shall be closed with tight fitting channel sections of 18 gauge stainless steel, welded in place, and closed on top and bottom. Drawer suspension slides shall be secured to drawer frame assembly and shall be Component Hardware S52 series full extension type with 14 gauge stainless steel slides with stainless steel ball bearing wheels having a load capacity of 200 pounds. Provide hard rubber bumper drawer stops. Provide drawer fronts with full grip recessed stainless steel flush pull handles.

G. CABINET BASES

1. Cabinet body shall be fabricated of 18 gauge stainless steel wrap around construction. The backs of front stiles shall be closed with tight fitting channel sections of 18 gauge stainless steel, welded in place and closed on top and bottom.
2. Cabinet base shelves shall be fixed bottom and intermediate fabricated of 18 gauge stainless steel. Front edge shall be turned down 1 1/2" at 90 degrees, returned 1/2" at 90 degrees. Rear and ends shall be turned up 2" at 90 degrees with interior corners coved on a ¾" radius. Shelf shall be weld anchored to cabinet body. Bottom shelf shall be fabricated flush with front mullions with fully welded facing junctures presenting

seamless construction. Fixed intermediate shelves shall be designed similar to bottom shelf except front edge shall be set behind vertical mullions and fully welded thereto.

H. SLIDING DOORS

1. Sliding doors shall be double pan type constructed of 16 gauge stainless steel with inner pan set into outer pan and welded in place. Doors shall have welded internally 1" x 4" x 1" 14 gauge stainless steel hat type reinforcing channels. Doors shall be fitted with full grip, recessed type stainless steel flush pull handles. Provide 16 gauge stainless steel angle door stops welded to door. Provide hard rubber door stops. Provide each door with two, 1 3/8" diameter stainless steel ball bearing sheaves fastened to 1" x 1/8" thick stainless steel bar stock hangers welded to top corners of each door for suspending on overhead door channel track. Provide hangers with stainless steel removable locks to prevent doors from jumping track during operation while permitting ease of removal. Fabricate overhead track of 14 gauge stainless steel and weld to cabinet body. Provide bottom of doors with nylon door guides secured to bottom shelf. Guides shall not interfere with door removal.

I. HINGED DOORS

1. Hinged doors shall be double pan type constructed of 16 gauge stainless steel with inner pan set into outer pan and welded in place. Hinges shall be stainless steel cam action pin type fastened by means of counter sunk flat head stainless steel screws staggered on centers and tapped into 1/4" thick stainless steel bar stock welded behind door jamb. Doors shall be removable from hinges without the use of tools. Doors shall be held closed by permanent magnet closure devices. Doors shall be fitted with a full grip recessed type stainless steel flush pull handles. Provide hard rubber door stop bumpers.

J. SINKS

1. Sinks shall be fabricated of 14 gauge stainless steel with all interior corners coved on a ¾” radius both horizontally and vertically forming spherical corners.
2. Exposed edges of sink shall be finished with a 1 ½" diameter 180 degree rolled edge, rear and sides adjacent to adjoining surfaces shall have a backsplash turned up 10" high at a 90 degree angle on a ¾” radius and turned back 2 ½" on a 45 degree angle, then down ½" at 90 degrees along back.
3. Multiple sink compartments shall be divided with double wall 14 gauge stainless steel partitions 1" wide rounded on top and all corners at a ¾” radius. Finish bottom, back and front with 14 gauge stainless steel to form one continuous sink with no overlapping joints or open spaces between sink compartments.
4. Integral drainboards shall be constructed of 14 gauge stainless steel. The front portion shall continue the 1 ½" diameter 180 degree rolled rim of the sink bowl on a continuous level horizontal plane. The surface of the drainboard shall be pitched from 2 ½" at the end away from the sink to 3" at the sink bowl. Sink and drainboard backsplash shall be continuous and level on the horizontal plane. All interior corners both vertical and horizontal shall be coved on a ¾” radius. Drainboards shall be reinforced with 1" x 4" x 1", 12 gauge stainless steel “hat” channels extending front to rear tack welded to underside of drainboard for weld anchoring leg gussets.
5. Provide crossrails extending front to rear between legs, crossrails shall not extend along rear at sink to prevent interference with plumbing.

6. Built-in sink compartments shall be fabricated as an integral part of fixture with sink fully welded with adjacent top, weld ground smooth and polished.

K. MILLWORK

1. Millwork fabricator shop shall be a certified participant in AWI's Quality Certification Program (QCP) to standard "Premium" construction.
2. Tops shall be fabricated of 3/4" thick 5-7 ply BW marine grade plywood build up to a 1 ½" thickness. All plastic laminate finished edges shall be applied prior to the surface laminate. Provide cross bracing around entire perimeter below tops and above all interior dividers to minimize deflection from equipment. Tops shall be fabricated in sections as large as possible to minimize field seams. Field seams shall be assembled utilizing TB-2 yellow glue. The bottom surfaces of all tops must be sealed with gray cabinet liner to comply with Board of Health requirements. Cut-outs for drop-in equipment shall be cut in the shop and with all edges sealed. All drop-in equipment shall be pre-fitted in top prior to delivery to the job site. All drop-in equipment shall be sealed with General Electric or equivalent clear silicon sealer after installation. Hardwood edges shall be applied prior to surface laminate. All hardwood to match for color and grain. Edges to be chamfered and finished as specified. Solid surface tops shall receive full plywood substrate with 3/4" x 3" batons for proper air space. All tops shall be prepared for installation of sneeze guards including additional blocking and / or cutouts.
3. All cabinet base and interiors shall be fabricated of 3/4" thick 5-7 ply marine grade plywood with high-pressure laminate finish. Recessed toe base shall be 6" high fabricated of 3/4" thick 5-7 ply marine grade plywood with 16 gauge stainless steel finish. Shelf pilasters to be recessed type 250WH with 253WH locking clips. Cabinet backs shall be fabricated of 1/4" thick MELA-MDF board. Cabinet ends to be dadoed for back and bottom and notched to receive aprons and kicks. Butt or dowel construction will not be acceptable. Cabinets shall be assembled with TB-2 yellow glue with screws and staples. Cabinets with finished backs shall be fabricated of 3/4" thick 5-7 marine grade plywood with high-pressure laminate finish. Cabinets over 48" in length shall have interior dividers. Dividers shall be dadoed into the bottom and notched for aprons. Dividers shall be notched as required for equipment. Aprons shall be large enough to conceal drop-in equipment and also to house control panels. Cabinet bases shall be fabricated in sections as large as possible to minimize field seams.
4. Doors shall be fabricated of 3/4" thick MDF board with high-pressure laminate finish and shall be furnished with three BLUM 75M5580 or 75M5680 European style concealed hinges. Door pulls shall be Hafele 116.39.437. Locks where required shall be cam style, keyed alike. Doors shall not exceed 27" in width and shall be of equal size.
5. Drawers shall be constructed of 3/8" thick birchwood with dove tail joinery. Drawer slides shall be Accuride 150 lb. full extension type with stainless steel ball bearing hardware.
6. Applied wood fascia panels and doors shall be stile and rail design. Panels to be recessed or raised as specified. All wood to be select for color and grain. Finish shall match stock color samples or custom to match furnished sample. All panels and doors to be equally sized per cabinet. Provide full wood louvered panels as required for equipment requiring air circulation. Finish all wood with stain followed by single coat of sealer. After sealer, apply one layer of Armourcote conversion varnish approved for use in food service with 55% gloss.

L. SOLID AND HARD SURFACE MATERIAL ("CORIAN" / "ZODIAK")

1. Provide counter top, tray slide, etc. of approved solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated on the food service and architectural detail drawings, routed and finished as directed. Openings shall have radius corners and shall be reinforced with additional material. Where drop-in appliances are to set on tops, the fixture shall be furnished with a ¾" thick marine grade plywood sub-top fabricated with a perimeter frame extending through the opening in the top preventing the appliance from setting directly on the solid surface material and allowing the sub-top to distribute the weight of the appliance. Where heated appliances are to set on the top the sub-top is to be fabricated as above to prevent heat from being in direct contact with the solid surface top; additional fiberboard insulation material is to be provided where transfer of radiated heat will contact any solid surface material

M. PAINTING

1. Galvanized steel shall be cleaned and degreased with mineral spirits, primed with a minimum of two coats of primer and spray finished with a minimum of two coats of gray epoxy enamel paint

N. LAMINATED PLASTIC

1. All exposed surfaces shall be faced with 1/16" thick high pressure plastic laminate in color and pattern as specified.
2. All unexposed surfaces shall be faced with .020 or .030 gray thermoset decorative overlay.
3. Where the plastic laminate is to be bonded to removable or fixed panels the panels shall be fabricated of 3/4" thick close grain marine grade mahogany or birch plywood with surfaces bonded with waterproof glue.
4. Where the plastic laminate is to be bonded directly to the metal facing of a cabinet base table or counter, surfaces shall be bonded with contact adhesive.

O. CLOSURE TRIM

1. Provide closure trim pieces fabricated of 16 gauge stainless steel or of material and finish as specified, trim shall be one piece constructions furnished to seal both horizontal and vertical junctures and openings

2.5 STAINLESS STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal products" for recommendations relative to applying and designating finishes.

1. Remove or blend tool and die marks and stretch lines into finish.
2. Grind and polish surfaces to produce uniform directional textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

B. Concealed Surfaces: Minimum of 80 grit finish.

C. Exposed Surfaces: No. 4 finish (bright, directional polish) of 180 grit.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable temporary protective covering before shipment.

PART 3 - **EXECUTION**

3.1 EXAMINATION

A. Examine areas and conditions with Installer for compliance with requirements for installation tolerances, service-utility connections and other conditions affecting installation and performance of food service equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine roughing-in for piping, mechanical and electrical systems to verify actual locations of connections before installation

3.2 INSTALLATION

A. Set each item of fixed food service equipment securely in place, level and adjust to correct height. Anchor to supporting surface where required for sustained operation and use without shifting or dislocation. Provide concealed anchoring where possible. Adjust work surfaces to a level tolerance of 1/16" maximum offset and slope drainage surfaces at 1/16" per foot.

B. Complete field assembly of field joints by welding or bolting utilizing the method as indicated with the fixture. Grind all field welds smooth and polish. Set and trim all gaskets to be installed as part of field assembly.

C. Treat enclosed spaces that are inaccessible after food service equipment installation by covering all horizontal surfaces with powdered borax at a rate of 4 ounces per square foot.

D. Provide closure trim pieces fabricated of 16 gauge stainless steel or of material and finish as specified, trim shall be one piece construction furnished to seal both horizontal and vertical junctures and openings where the conditions given below occur:

1. Food service equipment is installed into wall openings. Trim shall apply to both sides of wall opening with all corners fully welded, ground smooth and polished.
2. Two or more items of food service equipment are butted together.
3. Food service equipment is installed against wall, columns other equipment resulting in a gap or juncture exceeding 1/4" in width.
4. An open gap of any size between the juncture or joint between adjoining items of food service equipment, wall or column surfaces which might result in the penetration or collection of grease or vermin.

E. Provide cut-outs and openings in food service equipment as required to extend plumbing, electric, steam or gas lines through the food service equipment either for interconnection of utility lines or final connection.

F. Seal around each item of food service equipment with sealant for gaps or spaces less than 1/4" in width and with stainless steel trim for gaps or spaces exceeding 1/4" in width. Closure strips shall conform to the shape and size of the surfaces or juncture to be sealed and shall be neatly scribed for a tight fit.

3.3 PROTECTION AND CLEANING

A. Provide final protection and maintain conditions in a manner acceptable to District, Manufacturer and Installer that ensure food service equipment is without damage or deterioration at the time of Substantial Completion.

B. After completion of the food service equipment installation and completion of other major work in the food service area remove protective coverings and clean and sanitize all food service equipment both internally and externally. Restore exposed and semi-exposed finished to remove abrasions or other surface damage, polish exposed metal surfaces and touch-up painted surfaces. Replace work which cannot be successfully restored.

3.4 COMMISIONING

A. Delay start-up of the food service equipment until utility services have been installed, completed and tested, balanced and adjusted for pressure and voltage, and until water and steam lines have been treated and cleaned for sanitation. Before start-up of the food service equipment lubricate in accordance with manufacturer’s instructions.

1. Coordinate food service equipment startup with service-utility testing, balancing and adjustments. Do not operate steam lines before they have been cleaned and sanitized.

B. Provide on-site demonstration and formal technical training by the manufacturer’s technical representative for each item of food service equipment as required to instruct the District and its personnel in the safe operation and sanitation and maintenance of the food service equipment.

C. Test each item of food service equipment for proper operation.

1. Repair or replace equipment that is defective in operation including units that operate below required capacity or that operate with excessive noise or vibration.
2. Test refrigeration equipment’s ability to maintain specified operating temperature under heavy-use conditions. Repair or replace equipment that does not maintain specified operating temperature.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Test motors and rotating equipment for proper rotation and lubricate moving parts according to manufacturer’s written instructions.
5. Test water, drain, gas, steam, oil, refrigerant and liquid-carrying components for leaks. Repair or replace leaking components.

6. Train District's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing and preventive maintenance for each food service equipment item.
7. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout".
8. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data".
9. Schedule training with District through Construction Manager with at least seven days advance notice.

3.5 SCHEDULE OF EQUIPMENT

A. Equipment Schedule: Refer to all Contract Documents pertaining to the food service areas. Equipment itemized along with brands and model numbers and salient features establish the standard for construction, operation and engineering criteria.

B. Equipment indicated below is intended to establish the standard of quality of the food service equipment. Alternate "Equal" products by other manufacturers may be considered if equivalent in design, performance, durability and function.

C. This document is the intellectual property of Corsi Associates and as such use by any other entity is prohibited.

ITEM #01	SNACK COUNTER
Quantity:	One (1)
Manufacturer:	Duke / Multiteria / Eagle Group
Construction:	Shape and size as per plan

Furnish and install counter assembly with Zodiaq solid surface material top and 18 gauge stainless steel cabinet base on working side.

Furnish die-raised utility chases through the cabinet body and openings with plastic grommets in the solid surface material counter top for passage of utility lines.

Counter base on working side shall be enclosed on the front, rear and ends with 18 gauge stainless steel wrap around type construction. Provide stainless steel fully welded channel frame around the entire perimeter of the counter top with intermediate cross bracing extending front to rear on centers not to exceed 24" to support Zodiaq top. Provide counter base with solid fixed open bottom and intermediate shelves constructed of 16 gauge stainless steel unless specified otherwise. The front edge of each shelf shall be turned down 2" at 90 degrees and returned 1/2" at 90 degrees. Rear and ends shall be turned up 2" high on a 90 degree angle, interior corners coved on 3/4" radius.

All appliances and components to be furnished as built-in equipment as part of the counter shall be factory installed per the manufacturer's instruction, all electrical wiring and components shall conform to UL and shall be installed in accordance with the National Electric Code with all wiring extended to a junction box connection point in counter base with all wires tagged and identified.

Mount counter assembly on 12 gauge stainless steel triangular leg gusset mounting channels on centers not to exceed 48" in length and fully welded to the cabinet body. Mount counter assembly on 6” high 1 5/8” diameter 16 gauge stainless steel tubular legs with stainless steel adjustable bullet feet; fully weld legs to mounting gussets.

Provide 6” high recessed toe base on customers side and exposed ends fabricated of ¾" thick 5-7 ply marine grade plywood faced with 14 gauge stainless steel and secured to counter legs for removal without tools.

Provide on-site factory supervision during the installation of all custom fabrication as required through start-up.

ITEM #02 P.O.S.
Quantity: One (1)
Sup Info: Not in Foodservice Equipment contract, furnished by the District.

ITEM #03 HEATED DISPLAY MERCHANDISER
Quantity: One (1)
Manufacturer: Hatco / Merco / APW Wyott
Model: HZMH-30D

ITEM #04 MOBILE HEATED CABINET
Quantity: One (1)
Manufacturer: Alto-Shaam / Metro / Winston
Model: 750-CTUS
Options: Stainless steel adjustable pan slides
Perimeter bumper

ITEM #05 REACH-IN REFRIGERATOR
Quantity: One (1)
Manufacturer: True / Beverage-Air
Model: GDM-41-HC-LD
Options: Stainless steel interior
Stainless steel exterior
Stainless steel case back
Sliding glass doors
Exterior mounted digital thermometer
Automatic condensate evaporator
Swivel casters with polyurethane tires and front locking brakes
Plug and cord set

ITEM #06 PRETZEL MERCHANDISER (ADD ALTERNATE)
Quantity: One (1)
Manufacturer: Nemco / Hatco
Model: 6403

ITEM #07 HAND SINK (ADD ALTERNATE)
Quantity: One (1)

Manufacturer:	Advance Tabco / Eagle Group / John Boos
Model:	7-PS-66W
Options:	7-PS-35 Paper towel dispenser K-13 Soap dispenser Rubbermaid FG354060GRAY trash receptacle with FG267360GRAY swing top lid
Sup Info:	Furnish stainless steel mounting hardware of proper type for wall construction and to sustain weight while in use. Construction Trade shall provide wall blocking as required for mounting. Food Service Kitchen Equipment Contractor to verify soap dispenser and paper towel dispenser type with the Owner.

END OF SECTION 114000

SECTION 11 52 13
PROJECTION SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, Summary of Work. The Scope Information Sheets describe generally the work included in each contract, but the work is not necessarily limited to that described.

B. Front projection screen assemblies.

C. Rear projection screen assemblies.

1.02 RELATED REQUIREMENTS

A. Section 26 05 83 - Wiring Connections: Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

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

C. Shop Drawings: For custom installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.

D. Samples: For screen fabrics, submit two 4 by (4 mm) in size.

E. Samples: For case and frame finishes, submit two 2 by (4 mm) in size, illustrating color and texture of finish.

F. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Experienced in manufacturing products specified in this section.

B. Installer Qualifications: Experienced in installation of the work of this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened packaging. Inspect for damage and size before accepting delivery.

B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F (10 degrees C). Stack according to manufacturer's recommendations.

C. Acclimate screens to building temperatures for 24 hours prior to installation, or in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Maintain interior of building between 60 degrees F (15 degrees F) and 75 degrees F (24 degrees F) during and after installation of projection screens.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide one year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.01 FRONT PROJECTION SCREENS

A. Manufacturers:
   1. Da-Lite Screen Company: www.da-lite.com/#sle.
   2. Draper, Inc: www.draperinc.com.
   3. Stewart Film Screen Corporation.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Front Projection Screens: Factory assembled unless otherwise indicated.

C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
   1. Seams: No seams permitted in fabric up to 96 inches (2438 mm) high by 72 inches (1830 mm) wide.

D. Masking Borders: Black, four sides.

E. Extra Drops: Black; 11 inches (279 mm).

F. Concealed-in-Ceiling Screen Cases: Steel; integral roller brackets.
   1. Door Slat: Self trim; self-closing and -opening.
   2. Case Finish: Baked enamel.
   3. Case Color: White.
   4. End Caps: Steel; finished to match case.

G. Manually-Operated Screens:
   1. Roller: 1-3/4 inch (44 mm) aluminum; spring loaded with locking device.
   2. Screen Pull: Ring on bottom bar.
   3. Vertical Tensioning: Screen fabric weighted at bottom with steel bar with plastic end caps.

H. Electrically-Operated Screens:
   1. Roller: 2 inch (51 mm) aluminum, with locking device.
   2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar with plastic end caps.

I. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.02 FABRIC REAR PROJECTION SCREENS

A. Manufacturers:
   1. Stewart Filmscreen Corporation, Model CB ElectriScreen: www.stewartfilmscreen.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Rear Projection Screen Fabric: Translucent; washable; flame retardant and mildew resistant.
   1. Material: Vinyl fabric without backing, with nominal gain of 1.0 on axis, not less than 0.5 at 39 degrees from axis.
   2. Seams: No seams permitted in fabric up to 480 inches (____ mm) by 1080 inches (___ mm).

3. Color: Grey.
4. Screen Viewing Area: 264 inches wide with a 16 by 9 aspect ratio.
5. Masking Borders: Black
   a. Top: 121 inches.
   b. Bottom: 6 inches.
   c. Sides: 16 inches.
6. Acceptable Product: FilmScreen 100.

C. Frame: Retractable frame .
1. Finish: Black powder coat; self-trimming.
2. Screen Tensioning: Proprietary Tab-Guy system .
3. Webbing: Black, four sides.
4. Mounting: Hung from ceiling.

2.03 ELECTRICAL COMPONENTS

A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Motors: Direct drive, 110 V, 60 Hz.
1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type; equipped with thermal overload cut-off.
   a. Electrical Characteristics: 1.2 amps.
   b. Motor mounted on sound absorber.

C. Controls: 3 position control switch with plate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that openings for recessed screens are correctly sized.

D. Verify type and location of electrical connections.

E. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.02 PREPARATION

A. Coordinate screen installation with installation of projection systems.

B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Do not field cut screens.

C. Install screens in mountings as specified and as indicated on drawings.

D. Install plumb and level.

E. Install electrically operated screens ready for connection to power and control systems by others.

F. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

G. Test electrical screens for proper working condition. Adjust as needed.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 24 13
WINDOW TREATMENT – ROLLER SHADES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manual roller shades with fascia and light filtering fabric for exterior clear glazed windows and interior vision panels and sidelights as scheduled.

1.02 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

B. NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

1.03 SUBMITTALS

A. Product data: Provide manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.

C. Samples for Initial Selection: For each colored component of each type of roller shade indicated.

D. Window Treatment Schedule: Submit Window Treatment Schedule using same room designations indicated on Drawings.

E. Maintenance Data: Include in maintenance manuals:
   1. Methods for maintaining roller shades/blinds and finishes.
   2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
   3. Operating hardware.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has successfully completed and serviced installations similar in scope to that indicated for this Project.

B. Source Limitations: Obtain each type of window treatment through one source from a single manufacturer.

C. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

D. Fire-Test-Response Characteristics: Provide window treatment materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Flame-Resistance Ratings: Passes NFPA 701.

E. Mock-Up: Provide a mock-up (manual shades only) of one roller shade assembly for evaluation of mounting, appearance and accessories.

1. Locate mock-up in window designated by Architect.
2. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in window treatment schedule.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install window treatment until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.07 WARRANTY

A. Products: Minimum 10 years from substantial completion or manufacturer’s standard warranty.

B. Installation: One year from substantial completion.

PART 2 - PRODUCTS

2.01 MANUAL ROLLER SHADES

A. Basis of specification
   1. For base bid:
      a. Draper Shade & Screen Co., Inc.; FlexShade XD ceiling mounted, single shadecloth, with Phifer 4400 3% open or similar.
      b. MechoShade: MechoShade/5 with EuroTwill 6000 ~3% open or similar.
   2. Color: One standard color as selected by Architect from manufacturer’s standard
   3. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for one roller shade band per roller.
   4. Direction of Roll: Regular, from back of roller.
   5. Mounting Brackets: Standard 1018 plated steel. Sizes to be compatible with window /shade size and clutch capacity. Bracket style to be compatible with mounting requirements and site conditions.
   6. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
   7. Fascia:
      a. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
      b. Fascia shall be able to be installed across two or more shade bands in one piece.
      c. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
      d. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.

8. Shade Operation: Manual - with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
9. Position of Clutch Operator: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated or dictated by field conditions.
10. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
11. Lift Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
12. Bead Chain: Nickel-plated metal or Stainless steel.
13. Cord Tensioner Mounting: As required per installation.
14. Operating Function: Stop and hold shade at any position in ascending or descending travel.

B. ROLLER SHADE FABRICATION
1. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
2. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.
   a. Lifting Mechanism: With permanently lubricated moving parts.
3. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
   a. Shade Units installed outside (typical) : If inside mount is required, edge of shade not exceed 1/4 inch from face of jamb.
   b. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
   c. Fabricate shadecloth to hang flat without buckling or distortion.
4. Installation Brackets: Shall allow for easy removal and reinstallation of shade, operating hardware and for hardware position and shade mounting method indicated.
5. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal non-corrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
6. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 ROLLER SHADE INSTALLATION AND ADJUSTING

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.03 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Remove surplus materials, rubbish, and debris resulting from installation upon completion of work, and leave areas of installation in neat, clean condition.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensure that roller shades are without damage or deterioration at time of Substantial Completion.

3.04 SCHEDULE

A. Provide roller shades at the following locations:
   1. All exterior windows, except windows serving corridors, stair towers, gymnasium, vestibules, and storage rooms.
   2. All interior vision panels, and side lites as follows:
      a. Between classrooms and corridors
      b. Between offices, conference rooms and corridors.
   3. Elsewhere as noted on drawings.

END OF SECTION

SECTION 12 34 00
LAMINATE CLAD CASEWORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Fixed modular laminate clad casework and components.

B. Countertops.

1.02 RELATED SECTIONS

A. Section 01 74 19 – Construction Waste Management.

B. Section 01 81 13 – Sustainable Design Requirements.

C. Section 01 81 14 – Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints & Coatings.

D. Section 01 81 19 – Indoor Air Quality Requirements.

E. Section 061000: Blocking within walls where indicated.

F. Section 09 6500 - Resilient Flooring: Base molding.

G. Section 12 36 00: Countertops

H. Division 15: Service fixtures, service waste lines, connections, and vents.

I. Division 16: Electrical service fixtures.

1.03 DEFINITIONS

A. Identification of casework components and related products by surface visibility.
   1. Open Interiors: Any open storage unit without solid door or drawer fronts, units with full glass insert doors and/or acrylic doors, and units with sliding solid doors.
   2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts.
   3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
   4. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.
   5. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.
   6. Concealed Surfaces: Any surface not visible after installation.

1.04 QUALITY ASSURANCE

A. Manufacturer: Minimum of 5 years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.

B. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1 testing standards.

C. Fabricator Qualifications (where fabricator is not an approved manufacturer of modular laminate clad casework):
   1. Company specializing in fabricating the products specified in this section with minimum ten years of documented experience.
   2. Company with at least one project in the past 5 years with value of woodwork within 50 percent of cost of woodwork for this Project.
   3. Current accredited, licensed participant in the specified certification program, and maintained throughout the duration of the project.
   4. Quality Certification:

a. Comply with AWI's Quality Certification Program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
b. Contractor, upon award of work, shall register the work under this section with the AWI Quality Certification Program (855-345-0991)
c. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
d. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

D. Sustainability and LEED Standards Certification:
1. Regional manufactured products with percentage by weight.
2. Recycled content calculated as 1/2 preconsumer + postconsumer.
3. VOC content limitations defined in Section 018114, "Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, and Coatings."
4. No Added Urea Formaldehyde in product.

1.05 SUBMITTALS

A. Comply with Section 013000, unless otherwise indicated.

B. Product Data: Manufacturer's catalog with specifications and construction details.

C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
1. Include section drawings of typical and special casework, work surfaces and accessories.
2. Indicate locations of plumbing and electrical service field connection by others.

D. Casework Samples:
1. Base cabinet: Cabinet conforming to specifications, with drawer and door.
2. Wall cabinet: Cabinet conforming to specifications, with door.
3. Cabinet samples shall be complete with specified hardware for doors, drawers and shelves.

E. Component samples: Two sets of samples for each of the following:
1. Decorative laminate color charts.
2. PVC edgings.

F. LEED Product and Material Data Summary Form: For all installed products and materials of this Section, complete the "LEED Product and Material Data Summary Form" (attached to end of Section 01 81 13 - Sustainable Design Requirements)
1. Product Material Cost: Provide the cost for material, or an assembled product, including taxes and delivery but excluding any cost for labor and equipment required for installation after the material is delivered to the site.
2. Product Data for Credit MRc4, Recycled Content: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Data for Credit MRc5, Regional Material: For products having regional materials, documentation indicating location of raw material extraction, harvest or recovery, as well as, manufacture (location of final assembly) within 500 miles of project site. Include statement indicating cost for each material or component of the assembled product.

4. Product Data for Credit EQc4.4, Composite Wood & Agrifiber Products: Product data sheets, MSDS, certificates or letter from product manufacture highlighting that the composite wood or agrifiber product and/or associated laminating adhesive do not contain urea-formaldehyde resin.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications (where fabricator is not an approved manufacturer of modular laminate clad casework): Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited, licensed participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Comply with AWI's Quality Certification Program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
   3. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   4. Replace, repair, or rework all work for which certification is refused.

1.07 PRODUCT HANDLING

A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 25 percent to 55 percent.

B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.08 JOB CONDITIONS

A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.
   1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
   2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.

B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete.

1.09 WARRANTY

A. All materials and workmanship covered by this section will carry a five (5) year warranty from date of acceptance.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Approved Manufacturers:
   1. Basis of specification: TMI Systems Corporation; www.tmisystems.com/#sle.
   2. Wood-Metal Industries; www.wood-metal.com/#sle.
   3. Case Systems; www.casesystems.com/#sle.
   4. Stevens Industries, Inc.; www.stevensind.com
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Core Materials:
   1. Certified Particleboard: SCS Certified 100% pre-consumer recycled wood fiber particleboard with no Urea Formaldehyde added during the manufacturing process.
      a. Up to 7/8 inch thick: Industrial Grade average 47-pound density meeting ANSI A 208.1-1999, M-3 requirements.
      b. 1 inch think: Industrial Grade average 45-pound density meeting ANSI A 208.1-1999, M-2 requirements.
      c. MR Moisture Resistant Particleboard: Average 47-pound density particleboard, ANSI A208.1 1-1999, M-3.
   2. Medium Density Fiberboard 1/4 inch thick: Average 54-pound density grade, ANSI A208.2.

B. Decorative Laminates: GREENGAURD Indoor Air Quality Certified
   1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-2005.
   2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-2005.
   3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-2005.
   4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-2005.
   5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-2005.
   6. Thermally fused melamine laminate, NEMA Test LD 3-2005, color matched with White.

C. Edging Materials:
   1. Cabinet Body: 1mm PVC banding, machine applied.
   2. Door and counter edges: 3mm PVC banding, machine applied and machine profiled to 1/8 inch radius.

2.03 SPECIALTY ITEMS

A. Support Members:
   1. Countertop support brackets: Epoxy powder coated, 11 gauge steel with integral cleat mount opening and wire management opening.
   2. Undercounter support frames: Epoxy powder coated.
   3. Legs : Epoxy powder coated.

B. Miscellaneous:
   1. Product: Round Grommet A2340 manufactured by TMI Systems.
   2. Diameter: 3-5/8 inches

C. Teacher wardrobe:
   1. See drawings for dimensions.
   2. Provide hinged door with lock, one fixed shelf and rod, four adjustable shelves in 72" height; 5 adjustable shelves in 84" height; one 10" x12" mirror; pin tray; 16" coat hanging space. Provide with all closures and standard accessories shown or required.

2.04 CABINET HARDWARE

A. Hinges:
   1. Five knuckle, epoxy powder coated, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.
      a. Doors 48 inches and over in height have 3 hinges per door.
      b. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.

B. Pulls:

1. Door and drawer front pulls are rectangular, semi-recessed, injection molded plastic, screw fastened. Pull design shall comply with the Americans with Disability Act (ADA).
2. Stainless Steel Wire Pulls (4 inch).

C. Drawer Slides:
1. Regular, knee space and pencil: 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature.
2. Paper storage: 150-pound load rated epoxy coated steel slides.
3. File: Full extension, 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature.

D. Adjustable Shelf Supports:
1. Injection molded transparent polycarbonate shelf supports friction fit into cabinet end panels and vertical dividers, adjustable. Shelf support have minimum 2 integral support pins to interface pre-drilled holes, and to prevent accidental rotation of support. The support shall adapt to 3/4 inch or 1 inch thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.

E. Locks:
1. Removable core, disc tumbler, cam style lock with strike. Lock for sliding 3/4 inch thick doors is a disc type plunger lock, sliding door type with strike.
2. Elbow catch or chain bolt used to secure inactive door on all locked cabinets.

F. Coat Rods: 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.

G. File Suspension System: Extruded molding integral with top of drawer box sides to accept standard hanging file folders.

H. Mirrors: 1/4 inch thick polished mirror plate.

2.05 FABRICATION:

A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.

B. All casework panel components sized/cured to be precisely finished in size and squareness to within 0.010 inches, ensuring strict dimensional quality and structural integrity in the final fabricated product.

C. Cabinet Body Construction:
1. Tops and bottoms shall be glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals.
   a. Tops, bottoms and sides of all cabinets are particleboard core.
   b. Tops, bottoms and sides of sink base units are moisture resistant particleboard core.
2. Cabinet backs: 1/4 inch thick medium density fiberboard panel fully captured by the cabinet top, bottom and side panels. Finish to match cabinet interior. 3/4 inch x 4 inch particleboard rails will be placed behind the back panel at the top and bottom, and doweled to the sides utilizing 10mm hardwood fluted dowels. A third intermediate rail will be included on all cabinets taller than 56 inches. Utilize hot melt glue to further secure back and increase overall strength.
3. Fixed base and tall cabinets shall have factory mounted bases of 3/4 inch thick exterior grade plywood. Base is nominal 4 inch high unless otherwise indicated on the drawings.

4. Base units, except sink base units: Full sub-top. Sink base units are provided with open top and a stretcher at the front, attached to the sides. Back to be split removable access panel.
5. Side panels and vertical dividers shall receive adjustable shelf hardware. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.
6. Exposed and semi exposed edges.
   a. Edging: 1mm PVC.
7. Adjustable shelf core: 3/4 inch thick particleboard up to 36 inches wide, 1 inch thick particleboard over 36 inches wide.
   a. Front edge: 1mm PVC.
8. Interior finish, units with open Interiors:
   a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with VGS high-pressure decorative laminate.
9. Interior finish, units with closed Interiors:
   a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate.
10. Exposed ends:
    a. Faced with VGS high-pressure decorative laminate.
11. Wall unit bottom:
    a. Faced with thermally fused melamine laminate.
12. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), are not permitted.

D. Drawers:
1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 3mm PVC.
2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.
3. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with thermally fused melamine. Minimum 1/2 inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.

E. Door/Drawer Fronts:
1. Core: 3/4 inch thick particleboard except at sink units which is 3/4 inch thick moisture resistant particleboard.
2. Provide double doors in opening in excess of 24 inches wide.
3. Faces:
   a. Exterior: VGS High-pressure decorative laminate.
   b. Interior: High-pressure cabinet liner CLS.
4. Door/drawer edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

F. Miscellaneous Shelving:
1. Core material: 3/4 inch or 1 inch thick particleboard.
2. Exterior: VGS High-pressure decorative laminate.
3. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

PART 3- EXECUTION

3.01 INSPECTION:

A. The casework contractor must examine the job site and the conditions under which the work under this section is to be performed, and notify the building owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until satisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PREPARATION:

A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.03 KEYING:

A. Key alike by room, unless otherwise instructed.

B. Allow for 2 locked cabinets in each room, overhead and/or base (excluding teacher wardrobe)

3.04 INSTALLATION:

A. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut for accurate fit.

B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.

C. Repair minor damage per plastic laminate manufacturer’s recommendations.

3.05 CLEANING:

A. Remove and dispose of all packing materials and related construction debris.

B. Clean cabinets inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the building owner.

3.06 COLOR SELECTION:

A. Laminate Color Selection: From Wilsonart, and Formica stock colors.

B. Hinge and Pull Color Selection: From manufacturer's standard

C. Miscellaneous Hardware Color Selection (support brackets, table frames, rail): From manufacturer's standard.

D. 1mm PVC Edge Banding Color Selection: From manufacturer's standard of colors matching decorative laminate.

E. 3mm PVC Edge Banding Color Selection: Match decorative laminate color selection.

END OF SECTION

SECTION 12 35 53.19
WOOD LABORATORY CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood cabinets and cabinet hardware.

B. Acid storage cabinets.

C. Countertops.

D. Service fittings and outlets.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

B. Section 12 36 00 - Countertops, Backsplashes and Window Stools: Additional requirements for countertops.

1.03 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches (1.066 m) above finished floor, tops of cases less than 72 inches (1.82 m) above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches (1.828 m) above finished floor and bottoms of cabinets more than 30 inches (0.762 m) but less than 42 inches (1.066 m) above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches (762 mm) above finished floor.

1.04 REFERENCE STANDARDS

A. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.

B. SEFA 1.2 - Laboratory Fume Hoods; 2010.

C. SEFA 2.3 - Installations; 2010.

D. SEFA 3 - Laboratory Work Surfaces; 2010.

E. SEFA 7 - Laboratory Fixtures; 2010.

F. SEFA 8W - Laboratory Grade Wood Casework; 2016.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Service Fixtures: Coordinate location and characteristics of service connections.

1.06 SUBMITTALS

A. Product Data: Component dimensions, configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.

B. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements placement dimensions and tolerances, clearances required, and utility locations, if any. Include

coordinated information for laboratory equipment specified in another section and/or furnished by Owner.

C. Shop Drawings: Casework locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required, and utility locations, if any.

D. Samples For Color Selection: Wood samples, fully finished, for color and species selection.

E. Test Reports: From independent laboratory indicating compliance with referenced chemical-resistance standards for cabinet finish and liner materials.

F. Manufacturer's Installation Instructions.

G. Maintenance Data: Manufacturer's recommendations for care and cleaning.

H. Finish touch-up kit for each type and color of materials provided.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Laboratory Casework:
   1. Kewaunee Scientific Corp: www.kewaunee.com.
   2. Subject to compliance with the specifications the products of the following manufacturers are approved:
      a. Diversified Woodcrafts, Inc.
      b. CiF Solutions.
      c. ICI (Institutional Casework Inc.) /CampbellRhea

2.02 WOOD LABORATORY CASEWORK

A. Wood Laboratory Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels.
   1. Species: Plain Sliced White Maple
   2. Style: Contemporary Full Overlay.
   3. Construction: Provide joints doweled, glued and screwed, except drawers may be lock shoulder jointed; with interior of units smooth and flush; cabinet bottom flush with top of face frame; without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
   4. Structural Performance: In addition to the requirements of SEFA 3, SEFA 7, and SEFA 8W, components safely support the following minimum loads:
      a. Base Units: 500 lbs/linear ft (744 kgs/linear m) across the cabinet ends.
      b. Suspended Units: 300 lbs (136 kgs) static load.
      c. Tables: 300 lbs (136 kgs), minimum, on four legs.
      d. Drawers: 125 lbs (57 kgs), minimum.
      e. Hanging Wall Cases: 300 lbs (136 kg).
      f. Shelves: 100 lbs (45 kgs), minimum.
   5. Fixture Locations: Cut and drill counter tops, backs, and other components for service outlets and fixtures.

6. Access Panels: Provide access panels for maintenance of utility service and mechanical and electrical components.
7. Scribes and Fillers: Where cabinets do not fit tight to adjacent construction, provide filler panels of matching construction and finish.
8. Casters: Provide 3 inch casters without brakes at mobile cabinets.
9. Finish: Factory-finish all exposed and semi-exposed surfaces with the same finish.
    a. Finish Performance: Provide finish on all surfaces having chemical resistance of Level 0 (no change) or Level 1 (slight change of gloss or slight discoloration) according to SEFA 8W and no visible effect when surface is exposed to:
        1) Hot water at temperature between 190 degrees F (88 degrees C) and 205 degrees F (96 degrees C) trickled down the test surface at 45 degree angle for 5 minutes.
        2) Constant moisture in the form of 2 by 3 by 1 inch (51 by 76 by 25 mm) thick cellulose sponge kept continually saturated with water and in contact with test surface for 100 hours.
    b. Preparation: Wood sanded smooth, free from dust and mill marks.
    c. Coating: Clear, superior-quality, chemical-resistant acyclic urethane; applied in accordance with manufacturer instructions, force-dried, sanded and wiped clean.
    d. Coats: Multiple coats as required to achieve minimum 1.5 mil (0.038 mm) dry film thickness.
    e. Appearance: Clear satin gloss; not cloudy or muddy.

B. Bookcases: Chemical storage open shelving units.
    1. Dimensions: 36 inches wide by 16 inches deep by 72 inches high.

C. Acid Storage Cabinets: 18 gage, double wall construction, with following exceptions:
    1. Manufacturer: Eagle Manufacturing; Product: VWR Catalog no. 56610-462.
    2. Completely lined with corrosion-resistant liner material; stainless steel fasteners for all connections and hardware inside cabinets.
    3. Shelves: Removable, same material as cabinet, covered with corrosion-resistant liner.
    4. Bottom Pan: Liquid-tight liner covering entire bottom of acid-storage cabinet.
    5. Vents: Comply with SEFA 1.2.
        a. Locate acid-storage cabinet vents in accordance with manufacturer's instructions.
        b. Vent base cabinets through work surface with manufacturer's vent kit.
        c. Vent each acid-storage cabinet separately.
        d. Seal penetrations with chemical-resistant sealant.
    6. Quantity: 1 (Chem Prep B202A)

D. Epoxy Resin Countertops: Refer to Section 12 3600.

E. Acid Storage Cabinet (countertop)
    1. Eagle Manufacturing, Model M04CRAW
    2. Bench-top corrosives storage cabinet: Constructed of heavy-duty High Density Polyethylene (HDPE), with lockable door, two adjustable shelves, sealed internal containment sump, two 2" poly vents with caps, and 'Caution corrosives' labels.
    3. Color: white.
    4. Quantity: 1 (Chem Prep B202A)

F. Flammable Storage Cabinet
    1. Eagle Manufacturing Model 1905
    2. 16 gallon capacity, with self-closing door, and constructed of 18-gauge steel, double walled.

a. Two vents, with 2" threaded fittings and fire baffle and cap.
b. Grounding attachment,
c. 3-point latch system
d. 2" raised, leakproof door sill.

3. Finish: yellow high gloss powder finish with red warning
4. Quantity: 1 (Chem Prep B202A)

2.03 MATERIALS

A. Wood-Based Materials:
1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

B. Exposed Solid Wood: Clear, dry, sound, plain sawn, selected for compatible grain and color, no defects.

C. Exposed Hardwood Plywood: Veneer core; HPVA HP-1 Grade AA, Type I; same species as exposed solid wood, clear, compatible grain and color, no defects. Band exposed edges with solid wood of same species as veneer.

D. Semi-Exposed Solid Wood: Dry, sound, plain sawn, no appearance defects, any species similar in color and grain to exposed portions.

E. Semi-Exposed Hardwood Plywood: Veneer core; HPVA HP-1 Grade C, Type I; plain sliced, any species similar in color and grain to exposed portions.

F. Liner Material: High-density, asbestos-free, non-combustible, calcium-silicate-based panel consisting of autoclaved Portland cement, mineral fillers and synthetic fibers.

G. Cabinet Hardware: Manufacturer's standard styles, exposed components stainless steel.
1. Finish of Exposed Components: No. 4 finish.
2. Locks: Disk tumbler locks, keyed alike in sets, masterkeyed..
a. Provide Lund key case, 200 key capacity.
3. Shelves:
a. Shelf Standards and Rests: Vertical chrome steel standards with rubber button fitted steel rests.
b. Shelf Brackets: Vertical chrome steel standards with chrome steel arms.
c. Shelf Lips: 1/2 inch solid hardwood lip at open shelves.
4. Swinging Doors:
a. Hinges: Offset pin.
b. Catches: Magnetic.
c. Pulls: Chrome wire pulls, 4 inches (102 mm) wide.
5. Drawers:
a. Pulls: Chrome wire pulls, 4 inches (102 mm) wide.
b. Slides: Steel, full extension arms, ball bearings; capacity as recommended by manufacturer for drawer height and width.

H. Rod Assemblies: Provide standard rod assembly, 3/4 inch diameter by 36 inch wide by 36 inch long.
1. Provide rod sockets and clamps for assemblies.

I. Service Fittings and Fixtures:
1. Natural Gas Outlet: Model: W-0263-00 (deck mounted, 90-degree) double gas fitting manufactured by Kewaunee.

2. Water Outlet: Model: W-034-00 deck mounted hot and cold mixing gooseneck faucet with W-0358-00 4" wrist blade handles manufactured by Kewaunee.

J. Octagonal Workstations:
1. Diversified Woodcrafts, model number as scheduled, or equivalent product of other approved manufacturers.
2. Construction: solid wood and wood veneers, with 1" black epoxy resin top.
3. Accessories:
   a. (4) GFI protected AC duplex receptacles
   b. (2) combination water/gas fixtures (where scheduled)
   c. (4) rod sockets
   d. 16" x 16" x 7" epoxy sink with strainer, stopper and trap (where scheduled)
   e. Access panel: For piped units, provide access panel in center pedestal to access valves for gas and water.
4. Storage (where scheduled):
   a. (16) locking drawers
   b. Drawer Inside Dimensions: 20.44"W x 10.75"D x 4.475"H.
5. Dimensions: 56"W x 56"D x 34"H
6. Workstation Types:
   a. Type A: Model No. 1546K, with sink, gas outlets, and storage
   b. Type B: Model No. 1516K, with sink, gas outlets (no storage)
   c. Type C: Model No. 1546KF, with storage (no sink, no gas)
   d. Type D: Model No. 1516KF, (no storage, no sink, no gas)
7. Schedule:

	B201	B201	B226	B227	B228	B229
Type A	3	3				
Type B	3	3				
Type C			3	3	3	3
Type D			3	3	3	3

K. Goggle Cabinets:
1. Sellstrom Model 2000 Monitor Germicidal Goggle Cabinet
2. Capacity: 35 goggles.
3. Description: Germicidal goggle monitor, designed to remove bacteria and prepare goggles for next use. Average kill rate: 99.2% at fve minutes.
   a. UL Listed, 120v.
   b. Provided with tamper resistant latches and lock
   c. Germicidal lamp shall have a 20 year limited warranty
   d. Five minute cycle controlled by timer
   e. Wall mounted with 7’ cord

L. Pegboards:
1. Kewaunee X-020015 epoxy resin pegboard with F-2940-00 stainless steel drip trough
2. Dimensions: 32” long x 29” high x 1” thick
3. Pegs: ½” diameter, 5” long black polypropylene.
4.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Environmental Conditions:
   1. Do not deliver casework until the following conditions have been met:
      a. Building has been enclosed (windows and doors sealed and weather-tight).
      b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
      c. Ceiling, overhead ductwork, piping, and lighting have been installed.
      d. Installation areas do not require further "wet work" construction.

B. Verify adequacy of support framing and anchors.

C. Verify that service connections are correctly located and of proper characteristics.

3.02 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.3.

B. Use anchoring devices to suit conditions and substrate materials encountered.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch (1.6 mm). In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch (1.6 mm) in 10 feet (3 m).
   2. Variation of Faces of Cabinets from a True Plane: 1/8 inch (3 mm) in 10 feet (3 m).
   3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
   4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.6 mm).

F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches (407 mm) on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.

G. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

H. Vented Cabinets: Install in strict compliance with manufacturer's written installation instructions.
   1. Install vent kits and connect to fume hood exhaust system.
   2. Use only rigid materials for venting. No flexible materials permitted.

I. Countertops: Install countertops in one true plane, with ends abutting at hairline joints, and no raised edges.

J. Replace units that are damaged, including those that have damaged finishes.

3.03 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.04 CLEANING

A. Clean casework surfaces thoroughly.

3.05 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.

C. Repair damage that occurs prior to Date of Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS, BACKSPLASHES AND WINDOW STOOLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for manufactured casework.

B. Wall-hung counters and vanity tops.

C. Sinks molded into countertops.

D. Epoxy resin sinks.

E. Solid surface window stools.

F. Solid surface thresholds.

1.02 RELATED REQUIREMENTS

A. Section 11 53 00 - Laboratory Equipment: Work surfaces inside fume hoods.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

E. IAPMO Z124 - Plastic Plumbing Fixtures; 2012.

F. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

H. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

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

B. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

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

D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Installation Instructions: Manufacturer's installation instructions and recommendations.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch (1.2 mm) nominal thickness.
      a. Finish: Matte or suede, gloss rating of 5 to 20.
      b. Surface Color and Pattern: As indicated on drawings.
   2. Exposed Edge Treatment: 3 mm edge banding, machine applied and machine profiled to 1/8 inch radius. Color as selected from manufacturers standard range of minimum 15 colors.
   3. Back and End Splashes: Same material, same construction.
   4. Wall Protection above Backsplash: Same sheet material without substrate, adhered directly to wall surface as shown.

C. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
   1. Flat Surface Thickness: 1 inch (25 mm), nominal.
   2. Chemical-Resistance: Provide products that resist the following chemicals with not more than Moderate Effect when tested in accordance with NEMA LD 3:
   3. Flammability: Self-extinguishing, when tested in accordance with ASTM D635.
   4. Surface Finish: Smooth, non-glare.
   5. Color: Black.
   6. Exposed Edge Shape: 3/16 inch (5 mm) radius corner.
   7. Drip Edge: Drip groove 1/8 inch (3 mm) wide and deep, located 1/2 inch (12 mm) back from edge on underside of all exposed edges.
   8. Back and End Splashes: Same material, same thickness; separate for field attachment.
   9. Sinks: Same material, same color; integrally molded with counter; bottom sloped to outlet; molded outlets; drain outlet located in back corner.
      a. Sides and Ends: 1/2 inch (12 mm) minimum thickness.
      b. Bottoms: 5/8 inch (16 mm) minimum thickness.
      c. Interior Corners: 1 inch (25 mm) minimum radius.
      d. Clamping collars for 1-1/2 or 2 inch (38 or 50 mm) diameter waste pipe, for sealed but not permanent connection.

e. Steel channel supports front to back on each side, fastened to underside of top to support twice full sink weight.

10. Inside Dimensions (unless otherwise noted):
    a. 21.5” x 15.5” x 11” deep.
11. Locations:
    a. All sinks in MS Science and Prep Rooms: A106, A107, A114, A208, A208A, A215, A234, A242, A242A.
    b. All sinks in HS Science Rooms and Prep Rooms: B201, B202, B202A, B224, B225, B226, B227, B228M B229, B230, B236, B256.

D. Solid Surfacing Countertops, Window Stools and Thresholds: Solid surfacing sheet or plastic resin casting over continuous substrate.
1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
    a. Manufacturers:
        1) Avonite Surfaces: www.avonitesurfaces.com.
        2) Dupont: www.corian.com.
        3) Formica Corporation: www.formica.com.
    b. Sinks and Bowls: Integral castings; minimum 3/4 inch (19 mm) wall thickness; comply with IAPMO Z124.
    c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
    d. Color and Pattern: As indicated on drawings.
    e. Sink size (inside dimensions): 16-1/4" x 12-3/4” x 5-1/4” deep;
        1) oval shape, seamless undermount.
    f. Provide offset overflow elbow connection to drain.
    g. Manufacturers:
        1) KarranUSA, "York" model; www.karran.com, or equivalent approved manufacturer/product.
3. Other Components Thickness: 1/2 inch (12 mm), minimum.
4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch (32 mm) thick; eased edge top and bottom.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.
6. Thresholds: As indicated on drawings.

2.02 MATERIALS

A. Wood-Based Components:
1. Wood fabricated from old growth timber is not permitted.
2. Provide sustainably harvested wood, certified or labeled as specified in Section 01 60 00 - Product Requirements.

B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

C. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

E. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches (102 mm), unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).

C. Attach epoxy resin countertops using compatible adhesive.

D. Seal joint between back/end splashes and vertical surfaces.

3.02 CLEANING

A. Clean countertops surfaces thoroughly.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 14 21 00
MACHINE ROOM-LESS (MRL) TRACTION ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies electric traction elevators.

B. Work Required:
   1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.
   2. All work shall be performed in a first class, safe and workmanlike manner.
   3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

C. Related Work
   1. Division 01 - Construction Facilities and Temporary Controls: protection of floor openings and personnel barriers; temporary power and lighting.
   2. Division 31 - Earthwork: excavation for elevator pit.
   3. Section 03 3000 - Cast-In-Place Concrete: elevator pit, and elevator machine foundation.
   4. Section 04 2000 - Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway doorframes, and grouting of sills.
   5. Section 05 5000 - Metal Fabrications: pit ladder and supports for entrances, rails and hoisting beam at top of elevator hoistway.
   6. Section 07 1300 - Sheet Waterproofing: waterproofing of elevator pit.
   7. Division 23 - Heating, Ventilating, and Air Conditioning: ventilation and temperature control of elevator equipment areas.
   8. Division 26 and 28 - Electrical, Electronic Safety and Security:
      a. Main disconnects for each elevator.
      b. Electrical power for elevator installation and testing.
      c. Disconnecting device to elevator equipment prior to activation of sprinkler system.
      d. The installation of dedicated GFCI receptacles in the pit and overhead.
      e. Lighting in controller area, machine area and pit.
      f. Wiring for telephone service to controller.
      g. Emergency (Standby) Power Supply Systems: emergency generator for elevator operation.
      h. Fire Alarm Systems: The installation of fire and smoke detectors at required locations and interconnecting devices; fire alarm signal lines to contacts in the machine area.
      i. Telephone Systems: ADAAG-required emergency communications equipment.
      j. Access Control: for card readers at elevator call stations.

D. Applicable Codes: Comply with applicable building and elevator codes at the project site, including but not limited to the following:
   1. ANSI A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
   2. ANSI/NFPA 70, National Electrical Code.
   3. ANSI/NFPA 80, Fire Doors and Windows.
   4. ASME/ANSI A17.7, Safety Code for Elevators and Escalators.

5. ANSI/UL 10B, Fire Tests of Door Assemblies.
6. Local Building Codes

1.02 SYSTEM DESCRIPTION: ELEVATOR NO. 1

A. Equipment Description: 3100 MRL gearless traction elevator with Machine Room-less application.

B. Equipment Control: Selective Collective Control System.

C. Quantity of Elevators: 1

D. Elevator Stop Designations:
   1. Elevator No. 1 1, 2

E. Stops (maximum): 3

F. Openings: 2 front

G. Travel: as shown.

H. Rated Capacity: 3500 lb.

I. Rated Speed: 100 fpm

J. Cab Height: 8'-0"

K. Entrance Type and Width:
   1. Two-Speed Doors 3'-6”.

L. Entrance Height: 7’ 0”

M. Main Power Supply: 480 Volts + or - 5% of normal, three-Phase, with a separate equipment grounding conductor.

N. Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.

O. Machine Location: Inside the hoistway at the top Signal Fixtures: Manufacturer’s standard.

P. Controller Location: Controller(s) shall be located adjacent to the hoistway at the top landing in a controller space

Q. Performance:
   1. Car Speed: + 3 % of contract speed under any loading condition or direction of travel.
   2. Car Capacity: Safely lower, stop and hold up to 125% of rated load. (code required).

R. Ride Quality:
   1. Vertical Vibration (maximum): 12 - 17 milli-g
   2. Horizontal Vibration (maximum): 10 - 15 milli-g
   3. Vertical Jerk (maximum): 4.6 ± 1.0 ft./ sec3 (1.4 ± 0.3 m/ sec3)
   4. Acceleration/Deceleration (maximum): 2.6 ± .33 ft./ sec2 (0.8 ± 0.13 m/ sec2)
   5. In Car Noise: 50 - 55 dB(A)
   6. Stopping Accuracy: ± 0.2 in. (± 5 mm)
   7. Re-leveling Distance: ± 0.4 in. (± 10 mm)

S. Operation:
   1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

T. Operating Features - Standard
   1. Full Collective Operation
   2. Anti-nuisance.

3. Fan and Light Protection.
4. Load Weighing Bypass.
5. Independent Service.
6. Full Collective Operation.
7. Firefighters' Service Phase I and Phase II
8. Top of Car Inspection.
9. Car to Lobby Operation.
10. Car Secure Access.
11. Provision for Card Reader at each Hall Station (Card Reader provided and Installed by others).

U. Door Control Features:
1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.
3. Primary door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening.
4. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

V. Provide equipment according to seismic zone: Refer to Structural Drawings.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer’s product data for each system proposed for use. Include the following:
1. Signal and operating fixtures, operating panels and indicators.
2. Cab design, dimensions and layout.
3. Hoistway-door and frame details.
4. Electrical characteristics and connection requirements.
5. Expected heat dissipation of elevator equipment in hoistway (BTU).
6. Color selection chart for Cab and Entrances.

B. Shop Drawings: Submit approval layout drawings. Include the following:
1. Car, guide rails, buffers and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Clearances and travel of car.
5. Clear inside hoistway and pit dimensions.
6. Location and sizes of access doors, hoistway entrances and frames.

C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

1.04 QUALITY ASSURANCE

A. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations or such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

B. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.

C. Perform structural steel design, fabrication, and installation in accordance with AISC 360, Specification for Structural Steel Buildings. Perform seismic design in accordance with applicable code.

D. Perform welding of steel in accordance with AWS D1.1/D1.1M.

E. Fabricate and install door and frame assemblies in accordance with NFPA 80.

F. Perform electrical work in accordance with NFPA 70.

G. Maintain one copy of each quality standard document on site.

H. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

I. Installer Qualifications: Employees and supervisor on payroll of elevator equipment manufacturer.

J. Products Requiring Fire Resistance Rating: Listed and classified by UL.

K. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 WARRANTY

A. The elevator contractor's warranty covers defective material and workmanship.
   1. The warranty period shall extend two (2) years from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator.
   2. The warranty excludes: ordinary wear and tear, improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor.

1.06 MAINTENANCE TOOLS AND DIAGNOSTIC EQUIPMENT

A. It is the intent of this specification to allow for the Owner's non-proprietary maintenance of elevators and equipment.

B. Where specialized diagnostic tools or equipment are required in order to maintain elevator and elevator equipment, provide these tools and equipment to the Owner at project closeout.

C. Include diagnostic software, access codes, passwords and other proprietary information as necessary in order to interface with elevator equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Schindler Elevator Corp; [3100 MRL]: www.us.schindler.com.

B. ThyssenKrupp Elevator: www.thyssenkruppelevator.com.

C. Otis Elevator Co; : www.otis.com.

D. Kone Inc.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. All components to be manufactured by same entity.

2.02 ELEVATOR NO 1:

A. Provide machine room-less traction passenger elevators.

B. Basis of Design: 3100 MRL manufactured by Schindler Elevator Corporation.

C. Specifically, the system shall consist of the following components:
   1. Controller located entirely inside the hoistway. No extra machine room or control closet space required.
   2. An AC gearless machine using embedded permanent magnets mounted at the top of the hoistway.
   3. Polyurethane Coated-Steel Belts for elevator hoisting purposes.
   4. LED lighting standard in ceiling lights and elevator fixtures.
   5. Sleep mode operation for LED ceiling lights and car fan.

D. Approved Installer: Schindler Elevator Corporation

E. Controller Components:
   1. Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.
      a. All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.
      b. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
      c. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)
      d. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 - immunity"
   2. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided.

F. Machine and Governor:
   1. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.
   2. Governor: The governor shall be a tension type car-mounted governor.
   3. Buffers, Car and Counterweight: Oil type buffers shall be used.
   4. Hoistway Operating Devices:
      a. Emergency stop switch in the pit
      b. Terminal stopping switches.
   5. Positioning System: Consists of an encoder, reader box, and door zone vanes.
   6. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.
   7. Coated-Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords and a flat profile on the running surface and the backside of the belt. All driving sheaves and deflector sheaves should have a crowned profile to ensure center tracking of the belts. A continuous 24/7 monitoring system using resistance based technology has to be installed to continuously monitor the integrity of the coated steel belts and provide advanced notice of belt wear.
   8. Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.

2.03 HOISTWAY ENTRANCES:

A. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.

B. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.

C. Sills shall be extruded aluminum.

D. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
   1. Door finish: 5WL Textures stainless steel.

E. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour

F. Entrance Finish:
   1. #4 Finish satin stainless steel

G. Entrance marking plates: Entrance jambs shall be marked with 4" x 4" (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.

H. Sight Guards: sight guards will be furnished with all doors painted to match with painted doors.

2.04 EQUIPMENT: CAR COMPONENTS

A. Car frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame and shall be Type "B", flexible guide clamp type.

B. Cab:
   1. Steel Shell Cab with raised laminate hang on panels.
      a. Laminate to be selected from manufacturer's catalog of choices.
      b. Brushed Stainless Steel finished base plate located at top and bottom

C. Car Front Finish: Satin Stainless Steel.

D. Car Door Finish: Satin Stainless Steel.

E. Ceiling Type:
   1. #4 Stainless Steel, LED downlights.

F. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.

G. Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements.
   1. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise.
   2. A switch shall be provided in the car-operating panel to control the fan.

H. Handrail: Handrails shall be provided on the side and rear walls of the car enclosure. Handrails shall be 3/8" x 2" (9.5 mm x 51 mm) flat tubular handrail with a Brushed Steel.

I. Threshold: Extruded Aluminum.

J. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

K. Guides: Rubber roller guides shall be mounted on the top and the bottom of the car and counterweight. Car roller guides shall be 6-1/4" (160mm) at the top of the car, and 6-1/4" (160mm) at the bottom. The counterweight roller guides shall be 3" (76mm) at the top and the bottom.

L. Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the belts at the top of the hoistway.

M. The LED ceiling lights and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.

2.05 SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: A car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel finish
   1. A car operating panel shall be furnished. It shall contain a bank of round stainless steel, mechanical LED illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:

B. Vandal-Resistant, Flush satin stainless steel button with blue LED illuminating center jewel.

C. The car operating panel shall be equipped with the following features:
   1. Raised markings and Braille to the left hand side of each push-button.
   2. Car Position Indicator at the top of and integral to the car operating panel.
   3. Door open and door close buttons.
   4. Inspection key-switch.
   5. Elevator Data Plate marked with elevator capacity and car number.
   6. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
   7. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
   8. In car stop switch (toggle or key unless local code prohibits use)
   9. Firefighter's hat
   10. Firefighter's Phase II Key-switch
   11. Call Cancel Button

D. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.

E. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation.
   1. Integral Hall fixtures shall feature round stainless steel, mechanical buttons marked to correspond to the landings. Hall fixtures to be located in the entrance frame face or the wall. Buttons shall be in vertically mounted fixture. Fixture shall be Gold Satin finish.
   2. Vandal-Resistant, Flush satin stainless steel button with blue LED illuminating center jewel.
   3. Provide provisions for card reader at each hall station. Card readers shall be provided by Division 28 contractor.

F. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

G. Card Reader Provision

PART 3 - EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Installation of all elevator components except as specifically provided for elsewhere by others.

B. Install system components. Connect equipment to building utilities.

C. Provide conduit, boxes, wiring, and accessories.

D. Mount machines on vibration and acoustic isolators, on bed plate and concrete pad. Place on structural supports and bearing plates. Securely fasten to building supports. Prevent lateral displacement.

E. Accommodate equipment in space indicated.

F. Install guide rails using threaded bolts with metal shims and lock washers under nuts. Compensate for expansion and contraction movement of guide rails.

G. Accurately machine and align guide rails. Form smooth joints with machined splice plates.

H. Bolt or weld brackets directly to structural steel hoistway framing.

I. Field Welds: Chip and clean away oxidation and residue, wire brush; spot prime with two coats.

J. Coordinate installation of hoistway wall construction.

K. Install hoistway door sills, frames, and headers in hoistway walls. Grout sills in place. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.

L. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.

M. Adjust equipment for smooth and quiet operation.

3.03 ERECTION TOLERANCES

A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 .

3.04 FIELD QUALITY CONTROL

A. Perform testing and inspection in accordance with requirements of Section 01 40 00.
   1. Perform tests as required by ASME A17.2.
   2. Provide two weeks written notice of date and time of tests.
   3. Supply instruments and execute specific tests.

3.05 ADJUSTING

A. Adjust for smooth acceleration and deceleration of car so not to cause passenger discomfort.

B. Adjust automatic floor leveling feature at each floor to achieve 1/4 inch (6 mm) from flush.

3.06 CLEANING

A. Remove protective coverings from finished surfaces.

B. Clean surfaces and components ready for inspection.

3.07 PROTECTION

A. Do not permit construction traffic within cab after cleaning.

B. Protect installed products until project completion.

C. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

3.08 MAINTENANCE

A. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the elevator manufacturer or original installer.

B. Provide service and maintenance of elevator system and components for two (2) years from Date of Substantial Completion..

C. Examine system components monthly. Clean, adjust, and lubricate equipment.

D. Include systematic examination, adjustment, and lubrication of elevator equipment. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original equipment. Replace wire ropes when necessary to maintain the required factor of safety.

E. Perform work without removing cars during peak traffic periods.

F. Provide emergency call back service during working hours for this maintenance period.

3.09 DEMONSTRATION

A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

END OF SECTION