

**SECTION 000101.2  
PROJECT TITLE PAGE - VOL II**

**PROJECT MANUAL**

**FOR**

**CHICO AQUATIC AND RECREATIONAL FACILITY  
PROJECT NUMBER 23030 CH**

**100% PERMIT REVIEW AND BID  
1/24/25**

**VOLUME II OF III  
DIV 03-13 | (PAGE 157 OF 525)**

**PREPARED BY:**

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**033000**  
**CAST-IN-PLACE CONCRETE**

**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 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.
  5. Concrete toppings.

**1.03 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.

**1.04 ACTION 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.
  2. Submit substantiating data for each concrete mix design contemplated for use to the Architect no less than four weeks prior to first concrete placement. Data for each mix shall include the following:
    - a. Mix identification number (unique for each mix submitted).
    - b. Statement of intended mix use.
    - c. Mixture proportions.
    - d. Water/cementitious materials ratio.
    - e. Wet and dry unit weight.
    - f. Total air content.
    - g. Design slump and allowable range after additions of all admixtures.
    - h. Time limits on discharge: If time of discharge exceeds ACI 301 90-minute time limit, submit concrete properties criteria at permissible time of discharge and additional special inspection and testing requirements associated with time limits.
    - i. Compressive strength tests.
  3. Shrinkage testing per ASTM C 157.
  4. Lightweight Concrete:
    - a. Submit data relating strength to cement content.
    - b. Submit data demonstrating splitting tensile strength exceeds 5.7 times the square root of specified design compressive strength, f'c.
    - c. For lightweight concrete placed by pumping, separate mix designs are required for each 100 feet of vertical or horizontal distance from pump to point of discharge. Requirement may be waived if evidence acceptable to Architect is submitted demonstrating, by previous successful experience, that proposed mix will meet all requirements of these specifications, when sampled at point of discharge over full range of distances required.
    - d. Data correlating air-dry unit weight to fresh unit weight.

5. Maximum embodied carbon of Concrete Mix. Reference drawings for embodied carbon goals.
  6. Concrete strength maturity curves: For concrete specified with a 56-day f'c concrete strength, develop and submit strength-maturity relationship curves in accordance with ASTM C 1074. Extend maturity testing to 56 days.
- C. Before submitting concrete design mixtures to the architect for review, contractor shall review concrete design mixture for applications, state on the submittal where the concrete mix will be used, establish procedures for ensuring quality of concrete materials and verify suitability of mix design for placement and finishing.
- D. Mass concrete thermal control plans. See "Concrete Mixtures, General – Mass Concrete Performance and Design Requirements" section of this specification.
- E. 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.
1. Show all reinforcing, top and bottom profile of concrete element, supports below, including beams, columns and walls, grade beams, concrete walls, joists, etc. framing into element.
  2. Provide one continuous elevation at 1/4" (1:48) scale for all beams, joists or walls in a continuous line. Show pockets and openings in shear walls, structural slabs, beams, elevations of top of beams, walls, columns, sections through beams, pilasters, columns, and placing sequence of reinforcing for items with more than one reinforcing layer.
  3. Show locations of approved construction joints, locations of pour strips, splices of reinforcing, type of splice used and splice location. Identify all ASTM A706 and epoxy coated reinforcing locations.
- F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of Architect.
- G. Void Forms: Provide manufacturer's data on factory made void pieces. Submit evidence void is of proper size and shape after concrete placement. Submit evidence of void form material degradation as specified herein.

#### **1.05 INFORMATIONAL SUBMITTALS**

- A. 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. Fiber reinforcement.
  6. Waterstops.
  7. Curing compounds.
  8. Bonding agents.
  9. Vapor retarders.
  10. Repair materials.
  11. Supplementary Cementitious materials.
  12. Corrosion inhibitors.
- B. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates: Submit test reports indicating that aggregates are not potentially reactive based on the ASTM C295 or ASTM 1260 testing limits set forth in section 5.1 of "Guide Specification for Concrete Subject to Alkali-Silica Reactions" (2007 Portland Cement Association). Alternatively, submit ASTM C1567 test reports indicating that the combination of mix ingredients reduces the expansion due to Alkali aggregate reactivity such that the mix complies with section 5.2 of "Guide Specification for Concrete Subject to

Alkali-Silica Reactions” (2007 Portland Cement Association). All tests for submitted reports shall have been performed within one year of the submittal date.

- C. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- D. Minutes of preinstallation conference.
- E. Placement Notification: Submit notification to Architect at least 24 hours in advance of placement.
- F. Certification of chloride screen effectiveness for penetrating sealers.
- G. Proposed location of saw cut joints not indicated on Drawings.
- H. Curing compound data demonstrating specified moisture loss performance.
- I. Evaporative retarder product and application data.
- J. Mass concrete thermal monitoring records.
- K. Corrosion Inhibitor testing results.
- L. Sustainability Submittals:
  - 1. Submit product data or other published information verifying that this product has an environmental product declaration (EPD). Submit in accordance with Section 018113
  - 2. For products having recycled content, submit documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
  - 3. Location Valuation Factor
    - a. Submit product data or other published information verifying the location of manufacturing facility including name, address, and distance between manufacturing facility and the project site. Provide manufacturer's documentation indicating location where the base materials were extracted, mined, quarried, harvested, etc. and the distance between this location and the project site. Also include material cost (excluding costs of installation).
    - b. Include information on USGBC's v4.1 Building Product Disclosure and Optimization Calculator.

#### **1.06 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.
- 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.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 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.
  - 3. Personnel inspecting concrete reinforcing steel have current certification as an ACI Concrete Construction Inspector or have experience in concrete construction acceptable to the Architect.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- F. Formwork: Contractor shall be responsible for design and engineering of formwork. Design of formwork and preparation of formwork drawings shall be performed under supervision of a qualified engineer registered in the state of the project.
- G. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- H. Preinstallation Conference: Conduct conference at Project site or by video conference call.
  - 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Ready-mix concrete manufacturer.
    - c. Concrete subcontractor.
    - d. Special concrete finish subcontractor.
    - e. Owner's Testing/Inspection Agency.
  - 2. Review as applicable to Project 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, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving floor and slab flatness and levelness, floor and slab flatness and levelness measurement, concrete repair procedures, concrete protection, field sampling procedures for concrete cylinders and air testing, initial curing and field curing of field test cylinders (ASTM C31/C31M), protection of field cured field test cylinders.
  - 3. Minutes of the meeting shall be recorded by Contractor and distributed to all parties within five days. Provide one copy to Owner's representative and Architect.
- I. Record of Work: Maintain a record listing time and date of all structural concrete placement. Such record shall be kept until completion of Project and shall be available to Architect for examination at any time.
- J. Pre-Placement Inspection: Formwork installation, reinforcing steel placement and installation of all items to be embedded or cast into concrete shall be verified by Contractor prior to placement.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

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

### **PART 2 PRODUCTS**

#### **2.01 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. Medium-density overlay, Class 1 or better; mill-release agent treated, and edge sealed.
    - c. Structural 1, B-B or better; mill oiled, and edge sealed.

- d. B-B (Concrete Form), Class 1 or better; mill oiled, and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads. Provide factory-made sections with curved, closed faces around drilled piers. Curved face diameter shall match drilled pier diameter. Void forms intended to remain in place after concrete placement shall degrade sufficiently within three months after concrete placement.
- E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4-inch, minimum.
- F. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- G. 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.
- H. 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 1/2" inch to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

## 2.02 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Total recycled content not less than 95 percent.
- B. All steel reinforcement shall be produced using an electric arc furnace.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- D. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed, where welding of reinforcement or field bending is noted on Drawings.
- E. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 ASTM A 706/A 706M for bars that may be field bent, deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M for bars that are prefabricated, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- F. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- G. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated, as-drawn, plain steel wire, with less than 2 percent damaged coating in each 12-inch wire length.
- H. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.
- I. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain steel.

## 2.03 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

- B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.
- C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.
- D. 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. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- E. Mechanical Connectors: Mechanical couplers shall develop in tension or compression, as required, at least 125% of bar yield strength. Connectors shall comply with ICC-ES acceptance criteria, ACI 133.

## 2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Ordinary Portland Cement: ASTM C 150, Type as indicated on drawings, gray. Alternate cementitious materials when proposed to control alkali-silica reactions and tested as part of a representative concrete mix in accordance with ASTM C1567, may be used subject to approval.
  - 2. Supplementary Cementitious Materials (SCM): Of proportions and type to meet concrete performance criteria as indicated in the structural drawings. Available SCM's that may be incorporated into the Work include, but are not limited to, the following:
    - a. Fly Ash: ASTM C 618, Class F or C.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
    - c. Silica Fume: ASTM C 1240, amorphous silica.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials. All coarse and fine aggregate shall be tested per ASTM C 295 or ASTM C 1293 in accordance with section 5.1 of "Guide Specification for Concrete Subject to Alkali-Silica Reactions" (2007 Portland Cement Association).
  - 1. Maximum Coarse-Aggregate Size: As indicated on Drawings.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330 with size as indicated on Drawings.
- D. Water: ASTM C 94/C 94M and potable or ASTM C 1602 tested non-potable which is compatible with admixtures. Provide sample and obtain approval from architect of color and finish of exposed concrete mixes where non-potable water is used.

## 2.05 ADMIXTURES

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

6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
  7. Mid-Range Water Reducing Admixture: ASTM C 494/C 494M, Type A.
  8. Carbon Dioxide Mineralization: ASTM C494 Type S.
- 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 not containing more chloride ions than are present in municipal drinking water and complying with ASTM C 494/C 494M, Type C for set accelerating use and ASTM C1582 for corrosion-inhibitor use.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
    - b. BASF Construction Chemicals - Building Systems; Rheocrete CNI.
    - c. Euclid Chemical Company (The), an RPM company; ARRMATECT, EUCON BCN, or EUCON CIA.
    - d. Grace Construction Products, W. R. Grace & Co.; DCI.
    - 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 complying with and ASTM C1582 for corrosion-inhibitor use.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Construction Chemicals - Building Systems; Rheocrete 222+.
    - b. Cortec Corporation; MCI- 2000 or 2005NS.
    - c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
    - d. Sika Corporation; FerroGard 901.

## 2.06 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Monofilament or fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches. Submit proposed dosage for review per manufacturer's recommendations.

## 2.07 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. VOC Content: Evaporation retarders shall have a VOC content of 780 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
    - b. BASF Construction Chemicals - Building Systems; Confilm.
    - c. ChemMasters; SprayFilm.
    - d. Conspec by Dayton Superior; Aquafilm.
    - e. Dayton Superior Corporation; Sure Film (J-74).
    - f. Edoco by Dayton Superior; BurkeFilm.
    - g. Euclid Chemical Company (The), an RPM company; Eucobar.
    - h. Kaufman Products, Inc.; Vapor-Aid.
    - i. Lambert Corporation; LAMBCO Skin.
    - j. L&M Construction Chemicals, Inc.; E-CON.
    - k. Meadows, W. R., Inc.; EVAPRE.
    - l. Metalcrete Industries; Waterhold.
    - m. Nox-Crete Products Group; MONOFILM.
    - n. Sika Corporation; SikaFilm.
    - o. SpecChem, LLC; Spec Film.



- p. Symons by Dayton Superior; Finishing Aid.
  - q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
  - r. Unitex; PRO-FILM.
  - s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. 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. Film must chemically break down in a four-to-six-week period. Membrane-Forming Curing Compounds shall have a VOC content of 350 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A. Curing and sealing Compounds shall have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - G. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A. Class A. Curing and sealing Compounds shall have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - H. Concrete Waterproofing Admixture: by Xypex or approved equal

## 2.08 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Reglets: Fabricate reglets of not less than 0.022-inch- 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 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

## 2.09 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface 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 or coarse sand as recommended by topping manufacturer.

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

## 2.10 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 testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Supplementary Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement while meeting the embodied carbon limits listed on the drawings. Where indicated on the drawings, limit percentage, by weight, of cementitious materials other than Portland cement in concrete.
- C. Limit water-soluble, chloride-ion content in hardened concrete as listed on the drawings.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
  1. Use water-reducing, high-range 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. Performance and Design Requirements:
  1. Shrinkage: Shrinkage strain, determined in accordance with ASTM C 157 as amended and modified herein, shall not exceed the values below for each concrete class:
    - a. Amendments and modifications to ASTM C 157:
      - 1) Storage: After initial 24-hour comparator reading, specimens are placed back in lime saturated water until age of seven days. At seven days another comparator reading is taken. This reading is used as the base reading which is used to calculate percent shrinkage. The specimens are stored at 50% humidity and 73° F.
      - 2) Test Reports: Report gage length (average of three) after 4, 7, 14, 28, and 56 days. In addition to the information required by ASTM C 157, Section 11, shrinkage test reports shall include gage lengths (initial length measurements) used to determine reported shrinkage strains.
    - b. 28 Day Shrinkage Strain: Shrinkage strains shall not exceed the following:
      - 1) Concrete for slab-on-grade placed directly on vapor barrier: 0.046%.
  2. Mass Concrete – Thermal Control Plan: See drawings for dimensional limits on structural elements requiring a thermal control plan. Contractor to submit thermal control plan for mass concrete elements following the requirements of ACI 301-20, Section 8. Thermal control plan for mass concrete shall be prepared by qualified concrete specialty engineer. Maximum post placement concrete temperature shall not exceed 160°F unless substantiating data is submitted indicating higher temperature is acceptable. Maximum differential temperature shall not exceed 35°F. Thermal monitoring to verify compliance with thermal control plan is required. Monitoring locations shall be indicated in plan. Qualified Engineer: John Gajda, MJ2 Consulting, john@mj2consulting.com, 847-922-1886. Other qualified specialty engineers are acceptable; submit qualifications.

## 2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion structural normal-weight concrete mixture as noted on Drawings, unless aggregates are “potentially reactive” with alkalis based on the ASTM C 295 or ASTM C 1260 or ASTM C 1293 testing limits of Section 5.1 of “Guide Specification of Concrete Subject to Alkali-Silica Reactions” (2007 Portland Cement Association). When aggregates are “potentially reactive”, compliance with Section 5.2 of “Guide Specification for Concrete Subject to Alkali-Silica

Reactions" (2007 Portland Cement Association) must be established through ASTM C 1567 testing for proposed alternate concrete mixture. Submit test reports in accordance with Part I of this Specification.

## 2.12 FABRICATING REINFORCEMENT

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

## 2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.

## PART 3 EXECUTION

### 3.01 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. Concrete adjacent to elevator hoistway shall be installed to tolerances required by elevator manufacturer.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
  - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
  - 2. Class B, 1/4 inch for rough-formed finished surfaces.
  - 3. The permissible irregularity is a cumulative value due to all sources including layout, plumbness, member size, formwork offsets, joints, and member levelness. The permissible irregularity shall also apply between adjacent concrete surfaces on opposite sides of construction joint, expansion joint or shrinkage pour strip if present.
- 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. Form release agent shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- M. Protect void form from moisture at all times before concrete placement.

- N. Voids: Provide voids of full-size and extent shown on Drawings. Specified void form may be used at the Contractor's option. Where void forms are used below structural slab-at-grade, provide protective cover sheet in accordance with void manufacturer's recommendations. Prevent concrete from entering void space.
- O. All formwork surfaces that support concrete exposed to view must be accepted by Architect prior to concrete placement.

### 3.02 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 303 "Code of Standard Practice for Steel Buildings and Bridges."
    - a. Tolerance of Embedded Items: Comply with ACI 117.
      - 1) Anchor Rods:
        - a) Plumbness: Within +/- 1/16 inch over anchor rod projection.
      - 2) Embedded Plates and Weldments:
        - a) Location: +/- 1 inch vertical, +/- 1 inch horizontal.
        - b) Plumb and Alignment: 1/4 inch in 12 inches (1:48).
  - 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. Where masonry or veneer intersects concrete, provide one vertical dovetail slot for each 8 inches of masonry thickness. Where concrete serves as the backup, space slots at 16 inches on center.

### 3.03 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be 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.
  - 3. Leave formwork and shoring in place a minimum of 15 days after concrete placement unless reshoring is used.
- 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.

### 3.04 SHORES AND RESHORES

- A. Comply with ACI 318 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.
- D. Reshoring:
  - 1. If formwork and shoring are removed before concrete is 15 days old, reshoring shall remain in place a minimum of 15 days after placement irrespective of concrete strength.
  - 2. For multi-story construction, reshoring shall remain in place a minimum of 15 days after placing of concrete deck above irrespective of concrete strength.

### 3.05 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 in accordance ASTM E1643.
- 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/D 1.4M, where indicated.
- D. Size, length, number and placement of supports shall be sufficient as to maintain reinforcing position within specified tolerances during construction traffic and concrete placement.
- E. On vertical formwork, use approved bar chairs or spacers as required to maintain concrete cover and bar position. Do not staple or use any other metallic fastener to secure bolsters, chairs, etc. to formwork for concrete surfaces exposed to exterior.
- F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- G. 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.
- H. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

### 3.06 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.
  - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches 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~~ pilasters integral with walls, near corners, and in concealed locations where possible. Locate at centerline of support or middle third of span.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
  3. Interior Slabs-on-Grade to Receive Carpet or Wood Floor Covering: Construct slabs as large a placement area as practical. Unless noted otherwise on Drawings, locate construction joints on column centerlines. Provide control joints at column centerlines and at intervals not more than 30 feet each way.
  4. All Other Interior Slabs-on-Grade: Unless noted otherwise on Drawings, locate construction joints on column centerlines. Locate control joints where shown on Drawings. If not shown, provide control joints at column centerlines and at intervals not more than 10 feet each way.
- 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 or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "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. Joints in Slabs-on-Metal Deck: Locate construction joints as shown on Drawings. For slabs with welded wire reinforcing, continue reinforcing through construction joint and lap in adjacent pour. For slabs without welded wire reinforcing, provide #4 bar 4 feet in length spaced at 12 inches on center staggered along the joint. Do not provide control joints.
- F. Topping Slabs Exposed to View: Locate control joints where shown on the Contract Drawings. If not shown, locate topping slab control joints at column centerlines, over girders and at intervals not more than 10 feet each way.

### 3.07 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
    - a. Slabs supported by metal deck shall be gaged to provide the specified slab thickness over beams.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### **3.08 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.
- 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.

### **3.09 FINISHING FLOORS AND SLABS**

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, 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 in one direction.
  - 1. Apply scratch finish to surfaces indicated.

- 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 re-straightening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces indicated.
- 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
- E. Top of surface for slabs
  - 1. Slabs on ground shall be +/- .75"
  - 2. Formed suspended slabs, before removal of supporting shores +/- .75" Slab surface finish tolerance: Finish slab surfaces to the following tolerances according to ASTM E 1155 for a randomly trafficked floor surface:
  - 3. Slabs on grade (conventional): Specified overall values of flatness, SOF(F) 20; and of levelness, SOF(L) 15; with minimum local values of flatness, MLF(F) 17; and of levelness, MLF(L) 15.
  - 4. Slabs on grade (moderately flat): Specified overall values of flatness, SOF(F) 25; and of levelness, SOF(L) 20; with minimum local values of flatness, MLF(F) 17; and of levelness, MLF(L) 15.
  - 5. Slabs on grade (flat): Specified overall values of flatness, SOF(F) 35; and of levelness, SOF(L) 25; with minimum local values of flatness, MLF(F) 24; and of levelness, MLF(L) 17; for slabs-on-grade.
  - 6. Suspended formed slabs: Specified overall values of flatness, SOF(F) [30]; and of levelness, SOF(L) [20]; with minimum local values of flatness, MLF(F) [20]; and of levelness, MLF(L) [15]. Values are prior to form work removal.
  - 7. Suspended slabs on metal deck: Specified overall values of flatness, SOF(F) [30]; and no limit for levelness, SOF(L); with minimum local values of flatness, MLF(F) [20]; and of no limit for levelness, MLF(L).
  - 8. Slabs on grade (very flat): Specified overall values of flatness, SOF(F) 45; and of levelness, SOF(L) 35; with minimum local values of flatness, MLF(F) 30; and of levelness, MLF(L) 24.
  - 9. Slabs on grade (Super flat): Specified overall values of flatness, SOF(F) 60; and of levelness, SOF(L) 40; with minimum local values of flatness, MLF(F) 36; and of levelness, MLF(L) 27.
  - 10. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- F. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- G. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, 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.

### 3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. 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.

### 3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: 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 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, 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. Moisture-retaining-cover shall be inspected each day by Contractor. Any areas which do not show condensation on underside of cover or any slab areas which are not wet shall be immediately rewetted and cover replaced to prevent moisture loss.
    - 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. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

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.

### 3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning and that are unacceptable to Architect. Allow Architect and Structural Engineer to observe concrete surfaces upon removal of forms and prior to repair of surface defects. Defects in structural concrete shall be brought to the attention of the Architect and Structural Engineer.
  1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. 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. Submit proposed repair to Architect for review prior to commencement of work.
  1. Repair finished surfaces containing defects that are unacceptable to Architect. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.031 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. 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 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 or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around.

Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### **3.13 FIELD QUALITY CONTROL**

- A. Testing and Inspection: As indicated on Drawings.

### **3.14 PROTECTION OF LIQUID FLOOR TREATMENTS**

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

**END SECTION**

**SECTION 033500**  
**CONCRETE FLOOR FINISHING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface treatments for concrete floors and slabs, including:
  - 1. Clear sealers.

**1.02 REFERENCE STANDARDS**

- A. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with concrete floor placement and concrete floor curing.
  - 2. Coordinate with construction schedule to prevent detrimental damage due to activity in work areas.

**1.04 SUBMITTALS**

- A. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
- B. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

**1.06 FIELD CONDITIONS**

- A. Special Protection of Floor Finish Substrates:
  - 1. Provide special protection of concrete surfaces to receive specified floor finishes to prevent detrimental damage that prevents proper application of floor finishes and production of intended results; also comply with other protection requirements where specified in related specification Sections.
  - 2. Provide temporary and removable protective coverings to completely protect floor surfaces.
  - 3. Protect floors, stairs, and other surfaces prepared under other Sections from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
  - 4. Control activity in work area to prevent detrimental damage.
  - 5. Repair detrimental damage to satisfaction of Architect and Owner, at no additional cost to Owner.
- B. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.
- C. Do not finish floors until interior heating system is operational.
- D. Maintain ambient temperature of 50 degrees F minimum.

**PART 2 PRODUCTS**

**2.01 CONCRETE FLOOR FINISH APPLICATIONS**

- A. Unless otherwise indicated, all exposed concrete floors are to be finished using low gloss concrete sealer.

**2.02 FLOOR COATINGS**

- A. Low Gloss Clear Sealer: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315, Type 1, Class A.
  - 1. Vehicle: Water-based.
  - 2. Solids by Mass: 25 percent, minimum.
  - 3. VOC Content: OTC compliant, or as otherwise regulated by local jurisdiction.

4. Acceptable Products:
  - a. Kaufman Products Inc.; Krystal 25 OTC, or Krystal 25 Emulsion: [www.kaufmanproducts.net/#sle](http://www.kaufmanproducts.net/#sle).
  - b. SpecChem, LLC; Cure and Seal WB 25: [www.specchemllc.com/#sle](http://www.specchemllc.com/#sle).
  - c. W. R. Meadows, Inc.; Decra-Seal OTC: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
  - d. Substitutions: See Section 016000 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that floor surfaces are acceptable to receive the work of this Section.
- B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

#### **3.02 INSTALLATION - GENERAL**

- A. Apply materials in strict accordance with manufacturer's instructions.

#### **3.03 COATING APPLICATION**

- A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.
- C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

#### **3.04 PROTECTION**

- A. Provide special protection of concrete surfaces which have received specified floor finishes to prevent detrimental damage to finished flooring surfaces; also comply with other protection requirements where specified in related specification Sections.
  1. Provide protective coverings to completely protect floor surfaces.
- B. Control activity in work area to prevent detrimental damage.
- C. Repair detrimental damage to satisfaction of Architect and Owner, at no additional cost to Owner.

**END OF SECTION**

**042000  
UNIT MASONRY**

**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. This Section includes unit masonry assemblies consisting of the following:
  - 1. Concrete masonry units (CMUs).
  - 2. Decorative concrete masonry units.
  - 3. Pre-faced concrete masonry units.
  - 4. Concrete brick.
  - 5. Glazed brick.
  - 6. Firebox brick.
  - 7. Stone trim units.
  - 8. Mortar and grout.
  - 9. Reinforcing steel.
  - 10. Masonry joint reinforcement.
  - 11. Ties and anchors.
  - 12. Embedded flashing.
  - 13. Miscellaneous masonry accessories.
  - 14. Masonry-cell insulation.
  - 15. Cavity-wall insulation.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Dovetail slots for masonry anchors, installed under Division 03 Section "Cast-in-Place Concrete."
- C. Products installed, but not furnished, under this Section include the following:
  - 1. Cast-stone trim, furnished under Division 04 Section "Cast Stone Masonry."
  - 2. Steel lintels and shelf angles for unit masonry, furnished under Division 05 Section "Metal Fabrications."
  - 3. Manufactured reglets in masonry joints for metal flashing, furnished under Division 07 Section "Sheet Metal Flashing and Trim."
  - 4. Anchor bolts, weld plates, embed plates and bearing plates built into masonry. Furnished under Division 5.

**1.03 DEFINITIONS**

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Provide structural unit masonry that develops indicated net-area compressive strengths ( $f'_m$ ) at 28 days.
- B. Determine net-area compressive strength ( $f'_m$ ) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

**1.05 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
  - 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
  - 2. Drawings shall include:
    - a. Bar sizes, location and quantities of reinforcing steel.

- b. Location and arrangement of supporting and spacing devices.
  - c. Bending and cutting schedules.
  - d. Size and location of all openings, pockets, embedments, and anchor bolts.
  - e. Top and bottom elevations of walls and bearing elevations of all elements supported.
  - f. 1/4" scale elevations of all beams, columns and walls with all openings and reinforcing shown.
  - g. All control joints, expansion joints and horizontal relief joints.
  - h. All other framing and/or special conditions affecting the work.
  - i. Mechanical rebar splice locations.
- C. Qualification Data: For testing agency.
- D. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
- 1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
    - c. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
  - 2. Cementitious materials. Include brand, type, and name of manufacturer.
  - 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  - 4. Grout mixes. Include description of type and proportions of ingredients.
  - 5. Reinforcing bars.
  - 6. Joint reinforcement.
  - 7. Anchors, ties, and metal accessories.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
- 1. Include test reports, per ASTM C 780 for mortar mixes required to comply with property specification.
  - 2. Include test reports, per ASTM C 1019 for grout mixes required to comply with compressive strength requirement.
- F. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

#### 1.06 QUALITY ASSURANCE

- A. Preconstruction Testing Service: Contractor shall engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Contractor Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- 1. Clay Masonry Unit Test: For each type of unit required, per ASTM C 67.
  - 2. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
  - 3. Mortar Test (Property Specification): For each mix required, per ASTM C 780
  - 4. Grout Test (Compressive Strength): per ASTM C 1019
  - 5. Prism Test: For each type of construction required, per ASTM C 1314
  - 6. Current prism test: Prisms shall be grouted solid. Prisms shall be ungrouted with full face shell and cross web bedding and capping. Prisms shall be ungrouted with only face shell bedding and capping.
    - a. Include mortar and grout proportions used in test specimens.

- b. A set of five (5) prisms of each type of unit and each type of masonry assemblage shall be built and tested using the materials and proportions specified for the project. The average of the prisms shall exceed the specified 28-day strength (f'm). As an alternate, a prism test record consisting of at least 30 prism tests may be submitted to substantiate f'm. These prisms shall have been constructed under the observations of and have been tested by an approved Independent Testing Agency. Prisms must have been constructed with similar materials to those specified for this project. The average compressive strength of these tests shall exceed 1.33 f'm.
- B. 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.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. 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.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### **1.08 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.
  - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  - 2. Where 1 wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, 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.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by



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

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Products: Subject to compliance with requirements, provide one of the products specified.
  3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### **2.02 MASONRY UNITS, GENERAL**

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

### **2.03 CONCRETE MASONRY UNITS (CMUs)**

- A. Shapes: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  2. Provide square-edged bullnose units for outside corners, unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
    - a. Available Products:
      - 1) Addiment Incorporated; Block Plus W-10.
      - 2) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
      - 3) Master Builders, Inc.; Rheopel.
- C. Concrete Masonry Units: Hollow units, ASTM C 90, Type 1 moisture controlled.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 130% of prism strength. Prism strength is specified on the drawings, 1900 psi.
  2. Weight Classification: Lightweight (Less than 105 pounds per cubic foot over-dry weight of concrete, unless otherwise indicated.
  3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.04 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.
- D. Aggregate for Mortar: ASTM C 144.
- E. Aggregate for Grout: ASTM C 404.
  - 1. Additives: None permitted, except as specified herein. Specifically, do not lower freezing point of mortar or grout by use of calcium chloride or other antifreeze agents.
- F. Water: Potable.

## 2.05 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951
  - 1. Interior Walls: Hot-dip galvanized, carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized, carbon Stainless steel.
  - 3. Wire Size for Side Rods: W1.7 or 0.148-inch, W2.8 or 0.188-inch diameter.
  - 4. Wire Size for Cross Rods: W1.7 or 0.148-inch, W2.8 or 0.188-inch diameter.
  - 5. Wire Size for Veneer Ties: W1.7 or 0.148-inch, W2.8 or 0.188-inch diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
  - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:
  - 1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.
  - 2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
  - 3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.
- E. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.188-inch- diameter, hot-dip galvanized, carbon stainless-steel continuous wire.
- F. Mechanical Reinforcement Splices:
  - 1. Acceptable Products: Subject to compliance with all requirements which include but are not limited to:
    - a. Lenton Mason Lock Masonry Rebar Splices by ERI Co
    - b. Barlock Lockshear Coupler by Dayton Supplies

## 2.06 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
  - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
  - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.

3. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
  4. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
  5. Stainless-Steel Sheet: ASTM A 666, Type 304.
  6. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  7. Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
  2. Where wythes do not align use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
  3. Wire: Fabricate from 3/16-inch diameter, [hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls, unless otherwise indicated.
- D. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls, unless otherwise indicated.
  2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- 0.25-inch- diameter wire.
  3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.053-inch- thick, steel sheet, galvanized after fabrication.
  4. Tie Section for Concrete: Corrugated metal ties with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.
  5. Refer to division 4 Section "Unit Masonry" for other anchor requirements.
- E. Partition Top anchors: 0.097-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins, unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- G. Stone Anchors: Fabricate dowels, cramps, and other stone anchors from stainless steel.
- H. Adjustable Masonry-Veneer Anchors
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
    - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
  2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
  3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
    - a. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section.
    - b. Anchor Section: Sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch wide by [3-5/8

- inches] [5-1/2 inches] long, stamped into center to provide a slot between strap and plate for inserting wire tie.
- c. Anchor Section: Gasketed sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch wide by 6 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie. Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets manufactured to fit behind anchor plate and extend beyond pronged legs.
  - d. Anchor Section: Zinc-alloy barrel section with flanged head with eye and corrosion-resistant, self-drilling screw. Eye designed to receive wire tie and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.
  - e. Fabricate sheet metal anchor sections and other sheet metal parts from 0.067-inch-thick, steel sheet, galvanized after fabrication.
  - f. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch diameter, hot-dip galvanized steel wire.
  - g. Products:
    - 1) Dayton Superior Corporation, Dur-O-Wal Division; D/A 213 or approved equal.
4. Slip-in, Masonry-Veneer Anchors: Units consisting of a wire tie section and an anchor section designed to interlock with metal studs and be slipped into place as sheathing is installed.
- a. Wire-Type Anchor: Bent wire anchor section with an eye to receive the wire tie. Wire tie has a vertical leg that slips into the eye of anchor section and allows vertical adjustment. Both sections are made from 3/16-inch, hot-dip galvanized wire.
  - b. Strap-and-Wire Type Anchor: Flat metal strap with notch to interlock with flange of metal stud and two holes for inserting vertical legs of wire tie specially formed to fit anchor section. Strap is made from 0.067-inch-thick, steel sheet, galvanized after fabrication; anchor wire tie is made from 3/16-inch, hot-dip galvanized wire.
  - c. Available Products:
    - 1) BLOK-LOK Limited; STUD-LOK.
    - 2) Hohmann & Barnard, Inc.; AA308.
5. Seismic Masonry-Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in the veneer mortar joint.
- a. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical leg of connector section.
  - b. Connector Section: Rib-stiffened, sheet metal bent plate with down-turned leg designed to fit in anchor section slot and with integral tabs designed to engage continuous wire. Size connector to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
  - c. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section. Size wire tie to extend at least 1-1/2 inches into veneer but with at least 5/8-inch cover on outside face.
  - d. Connector Section: Sheet metal clip welded to wire tie with integral tabs designed to engage continuous wire.
  - e. Anchor Section: Gasketed sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom; top and bottom ends bent to form pronged legs to bridge insulation or sheathing and contact studs; and raised rib-stiffened strap, 5/8 inch wide by 6 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie. Provide anchor manufacturer's standard, self-adhering,

- modified bituminous gaskets manufactured to fit behind anchor plate and extend beyond pronged legs.
- f. Connector Section: Triangular wire tie and rigid PVC extrusion with snap-in grooves for inserting continuous wire. Size wire tie to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
  - g. Fabricate sheet metal anchor sections and other sheet metal parts from 0.067-inch-thick, steel sheet, galvanized after fabrication.
  - h. Fabricate wire connector sections from 0.188-inch diameter steel wire.
  - i. Products:
    - 1) Dayton Superior Corporation, Dur-O-Wal Division; D/A 213S or approved equal.
6. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange with not less than 3 exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
- a. Products:
    - 1) ITW Buildex; Teks Maxiseal with Climaseal finish or approved equal.
7. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads.
- a. Products:
    - 1) Dayton Superior Corporation, Dur-O-Wal Division; Stainless Steel SX Fastener or approved equal.

## 2.07 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
- C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- D. Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
  - 1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
  - 2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

## 2.08 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
  - 3. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement, mortar cement, and lime.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

- C. Mortar for Unit Masonry: Comply with ASTM C 270 BIA, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
  - 1. For masonry below grade or in contact with earth, use Type M.
  - 2. For reinforced masonry, use Type S.
  - 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476
  - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
  - 3. Fine and Course Grout: Minimum 28-day compressive strength of 130% of specified prism strength. Prism strength is specified on the drawings. 2000 psi required.
  - 4. Fine Grout: Proportion by volume. One part Portland Cement, with not more than one-tenth part hydrated lime or lime putty added, and two and one-fourth to three parts sand.
  - 5. Coarse Grout: Proportioned by volume. One part Portland Cement with not more than one-tenth part hydrated lime or lime putty added, two to three parts sand and not more than two parts gravel.

## 2.09 SOURCE QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:
  - 1. Payment for these services will be made by Owner.
  - 2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
- B. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Remove all dirt, ice, loose rust, and scale from walls, ties, and reinforcing prior to installation.
- D. Clean all equipment for mixing, transportation, and placing mortar before starting work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

### 3.03 LAYING MASONRY WALLS

- A. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- B. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- C. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
  - 1. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
  - 2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
  - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

### 3.04 MEASUREMENT AND MIXING OF MORTAR AND GROUT

- A. General:
  - 1. Grout to be used in high-lift grouted elements shall be batched at a concrete plant in accordance with ASTM C94 and delivered to the site in transit mix trucks or other suitable transportation devices.
  - 2. Grout to be used in low-lift grouted elements and mortar may be job-mixed. Conform to requirements listed below.
- B. Job-Mixed Mortar and Grout:
  - 1. Measurement: Method of measuring materials shall be by either volume or weight and such that specified proportions can be controlled and accurately maintained. Measurement of sand by shovel is not allowable.
  - 2. Mixing: Mix cementitious materials and aggregate for at least three minutes for mortar, five minutes for grout in a mechanical batch mixer, with the maximum amount of water to produce a workable consistency.
  - 3. Retempering: Mortars that have stiffened because of evaporation of water from the mortar may be retempered by adding water as frequently as needed to restore required consistency, except that mortar not used within 2-1/2 hours after initial mixing shall be discarded.

### 3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and concrete masonry units as follows:
  - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted. Do not place mortar in area under grouted cells.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

### 3.06 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together using one of the following methods:
  - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 4.5 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter

- of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
- a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
    - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
  3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 8 inches clear horizontally and 16 inches clear vertically.
- B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.
- C. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with mortar at exterior walls, except cavity walls, and interior walls and partitions.
- D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.
  1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
- E. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
  1. Provide individual metal ties not more than 8 inches o.c.
  2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.
  3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

### 3.07 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 4.5 sq. ft. of wall area spaced not to exceed 36 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
    - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
    - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
  2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
    - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
    - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
  3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 8 inches clear horizontally and 16 inches clear vertically.
  4. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.



- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.

### **3.08 MASONRY JOINT REINFORCEMENT**

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches o.c.
  - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
    - a. Reinforcement above is in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### **3.09 ANCHORING MASONRY TO STRUCTURAL MEMBERS**

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
  - 1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  - 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### **3.10 ANCHORING MASONRY VENEERS**

- A. Anchor masonry veneers to wall framing concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:
  - 1. Fasten screw-attached and seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  - 2. Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
  - 3. Embed tie sections connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
  - 4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  - 5. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
  - 6. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

### **3.11 LINTELS**

- A. Install steel lintels where indicated.

- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

### 3.12 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
  - 3. Columns and pilasters constructed with a perimeter of masonry and a grouted core shall be braced to prevent blowout during grouting. Column/pilaster reinforcing and joint reinforcing, if any, are not adequate to resist grouting pressures; external bracing shall be provided.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
  - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  - 2. Limit height of vertical grout pours to not more than 60 inches.
  - 3. Construct with vertical alignment of cells and other spaces to be grouted to provide continuous unobstructed openings.
  - 4. Grout spaces less than 2" in width with fine grout using low-lift grouting techniques. In spaces greater than 2", use coarse grout using high-lift or low-lift grouting techniques.
  - 5. Hold mortar in bed joints back 1/4" from edges of masonry unit adjacent to grout spaces, bevel back and upward from grout space. Keep mortar droppings out of grout spaces. Head and bed joints shall be formed by shoving units at least 1/2" into place. For hollow units, mortar cross webs adjacent to grouted cells.
  - 6. Support vertical reinforcement in position at top and bottom of lift and at intervals not exceeding 192 bar diameters.
  - 7. When the grouting is stopped for one hour or longer, stop pouring of grout 1-1/2" below the top of the uppermost unit.
  - 8. Unless otherwise indicated on the drawings, provide vertical control joints in masonry walls located within 2' of wall corners and intersections, at embedded pipes, adjacent to openings, pilasters and spaced not greater than 35' o.c.
- D. Low-Lift Grouting: Lay up masonry units, install reinforcing, and grout in lifts not exceeding 4' high. Immediately consolidate grout with mechanical vibration sufficient to cause grout to completely fill all grout spaces. Grout lifts 12" or less in height may be consolidated by puddling or with mechanical vibration. Reconsolidate after excess moisture has been absorbed but before plasticity is lost.
- E. High-Lift Grouting: Place vertical reinforcing in position after laying of masonry wall is completed, but prior to grouting.
  - 1. In grouted collar joint construction, build vertical grout barriers or dams of solid masonry across grout space approximately 30' apart. Barriers shall be continuous entire height of wall.
  - 2. Provide clean-out openings at bottom of each reinforced grout cell; omit every other unit on one side of wall for collar joint grouting. Where individual elements are grouted, provide one or more openings for each element. Clean-outs to be of sufficient size and location to

- allow cleaning and inspection of grout spaces. During work, remove excess mortar and clean grout space. Seal clean-out after inspection and before grouting.
3. Do not place grout until mortar has set and cured sufficiently to prevent "blow-outs." Deliver grout in transit mix trucks. Add water so slump is near maximum without segregation. Pump grout from mixer into grout space as rapidly as practical and discard if not in place within 1-1/2 hours after water is first added to batch.
  4. Depending upon weather conditions and absorption rate of masonry units, lift heights and waiting periods may be varied. Under normal weather conditions with typical masonry units, individual lifts of grout shall be limited to 6' in height with waiting period between lifts of 30 to 60 minutes.
  5. Consolidate by mechanical vibration during placing and reconsolidate after excess moisture has been absorbed before plasticity is lost. Reconsolidation may be done as next lift is placed. Complete grouting of any section of wall to top of wall in one (1) day.

### 3.13 FIELD QUALITY CONTROL

- A. Duties of Contractor:
  1. Contractor shall build and store masonry prisms and material specimens in a manner acceptable to the Testing Agency. Prisms and material specimens to be tested shall remain at the job site until moved by Testing Agency personnel.
- B. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
  1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
- C. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
  1. Payment for these services will be made by Owner.
  2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
  3. Prepare test specimens in accordance with the requirements of the governing building code.
- D. Tests, consisting of one set of three prisms each, made in the field from materials currently in use, shall be conducted for each 5000 square feet, or fraction thereof, of structural masonry throughout the course of construction. Not less than one such set shall be conducted for the project. Prisms shall be grouted solid.
- E. Additional tests above shall be conducted for the following elements:
- F. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.
- G. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.
- H. Mortar and grout tests shall be conducted on materials used to construct the first set of three prisms above. In the event such tests fail to achieve the required strength, perform additional testing as required by the Structural Engineer.
- I. Mortar Test (Property Specification): For each mix provided, per ASTM C 780 Test mortar for mortar air content and compressive strength.
- J. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019
- K. Prism Test: For each type of construction provided, per ASTM C 1314 at 7 days and at 28 days.
- L. Testing Agency shall provide special inspection complying with the requirements of the governing building code during the construction of the following work: work designated on the drawings as "special inspection required."
  1. Special inspection shall be performed for compliance with drawings and standards cited herein. Special inspection shall include the following:

- a. Observe preparation of all masonry prisms and preparation of all grout and mortar specimens.
- b. Verify all embedded bolts, plates, and dowels are installed, are the correct size, have the proper embedment, and are otherwise as specified.
- c. Verify masonry units, reinforcement, cement, lime, aggregate and all other materials meet the requirements of the contract documents. Verify all materials are properly stored.
- d. For masonry constructed by low-lift grouting techniques, observe the following at least 2 times each day that masonry construction is in progress: (Low-lift grouting is grouting which does not require clean-outs).
  - 1) Observe proportioning, mixing, and placing of mortar and grout. Observe placement of masonry units including construction details, procedures, and workmanship. Observe grout consolidation and reconsolidation.
  - 2) Observe type, size, and location of reinforcing, ties, and accessories. Observe placement, splice locations, and splice lengths.
- e. For masonry constructed by high-lift grouting techniques, observe the following: (High-lift grouting is grouting which requires clean-outs):
  - 1) Observe proportioning, mixing, and placing of mortar including provision for removal of mortar fins from inside of cells to be grouted.
  - 2) Observe placement of masonry units including construction details, procedures, and workmanship. Observe the size and location of clean-out openings.
  - 3) Observe type, size, and location of joint reinforcing, ties, and accessories.
    - a) The above shall be observed at least once each day that masonry construction is in progress.
  - 4) Immediately prior to the closing of clean-out openings for each section of masonry to be grouted, verify the following:
    - a) Verify all cells to be grouted are free of obstructions (including mortar fins) which would inhibit proper placement and consolidation of grout.
    - b) Verify bottom of all cells to be grouted have been thoroughly cleaned of all loose mortar and debris.
    - c) Verify proper size, type, and placement of all reinforcement in cells to be grouted. Verify reinforcement location, length of splices, and provision for maintaining proper position of reinforcing during grouting.
  - 5) Continuously observe all grouting operations to verify proper slump, consolidation, and reconsolidation of grout, proper height of each grout lift, and elapsed time between placement of successive lifts.
- f. Verify mechanical reinforcement splices installed are of the correct size and are correctly installed to proper tightness in accordance with ICC ER report requirements.
- g. Daily reports of all special inspections shall be prepared and distributed as specified in Section 01400 Quality Control with 48 hours of the time the inspections were made. Provide other reports as required by the governing building code.

**END SECTION**

**SECTION 042616**  
**ADHERED EXTERIOR MASONRY VENEER**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Adhered masonry veneer, including:
  - 1. Stone masonry veneer.
- B. Accessory materials, including:
  - 1. Mortar.
  - 2. Adhesives.
  - 3. Other specified accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- B. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- C. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

**1.03 SUBMITTALS**

- A. Product Data: Provide data for mortar and masonry veneer units.
- B. Verification Samples: For each masonry product, color, and texture selected, provide two full-size units representing actual color and texture of products to be installed.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing specified installation, with minimum of 5 years of documented experience.
- B. Basis of Design: Drawing details are based on masonry veneer products by specified basis of design manufacturer. Similar masonry veneer products by other acceptable manufacturers are permitted, subject to compliance with all specified performance characteristics, and provided that deviations in dimension, profile, and finish are minor, and do not detract from the indicated design intent.

**1.05 MOCK-UPS**

- A. Mock-up: Construct a mock-up panel sized 8 feet long by 6 feet high; include pointing mortar, adhesives, accessories, substrate, and representative wall openings in mock-up.
  - 1. Locate where directed.
  - 2. Mock-up may remain as part of the Work.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect adhesives and pointing mortar from freezing or overheating in accordance with manufacturer's instructions.
- B. Deliver products secured to shipping pallets, with individual faces protected from damage and discoloration. Protect corners from damage.
- C. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

**1.07 FIELD CONDITIONS**

- A. Do not install adhesives in an unventilated environment.
- B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. AAA Natural Stone: [www.aaa-naturalstone.com](http://www.aaa-naturalstone.com).
    - a. Stone Product/Color: Traditional Cream.
    - b. Thickness: 1-1/4 inch, nominal.
    - c. Pattern: Three height ashlar pattern.
    - d. Accessories: Manufactured corner pieces and other accessories as indicated on Drawings.

### **2.02 BACKING BOARD MATERIALS**

- A. Extruded Polystyrene Board Insulation Faced with Cement Backer Board: Extruded polystyrene board; with proprietary cement backer board on one face, and the following characteristics:
  - 1. Type: ASTM C578, Type X.
  - 2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
  - 3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
  - 4. R-value; 1 inch of material at 72 degrees F: 5, minimum.
  - 5. Board Thickness: 1-1/4 inches, unless otherwise indicated.
  - 6. Board Edges: Square.
  - 7. Compressive Resistance: 15 psi.
  - 8. Board Density: 1.30 lb/cu ft.
  - 9. Water Absorption - Maximum: 0.3 percent, by volume.
  - 10. Acceptable Product:
    - a. National Gypsum Company; PermaBASE Insulated CI: [www.nationalgypsum.com/#sle](http://www.nationalgypsum.com/#sle).

### **2.03 ADHESIVE MATERIALS**

- A. Acceptable Manufacturers:
  - 1. LATICRETE International, Inc.; LATICRETE MVIS Hi-Bond Veneer Mortar: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
  - 2. Sika Corporation; Masonry Veneer Adhesive: [www.parexusa.com/#sle](http://www.parexusa.com/#sle).

### **2.04 MORTAR MATERIALS**

- A. Hydrated Lime: ASTM C207, Type S.
- B. Mortar Aggregate: ASTM C144.
- C. Water: Clean and potable.

### **2.05 MORTAR MIXES**

- A. Pointing Mortar for Unit Masonry: ASTM C270, Property Specification.
  - 1. Exterior, Non-loadbearing Masonry: Type N.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

### **2.06 ACCESSORIES**

- A. Crack Isolation Membrane: One-component, load-bearing, fluid-applied, self-curing, water-based, bulk water management and crack isolation membrane.
  - 1. Acceptable Product:
    - a. LATICRETE International, Inc.; LATICRETE MVIS WCI: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
- B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
  - 1. Acceptable Product:
    - a. ProSoCo, Inc.; Safety Clean: [www.prosoco.com](http://www.prosoco.com).

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive simulated stone veneer.
- 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 installation of simulated stone veneer.

### **3.02 INSTALLATION - INSULATION BOARD**

- A. Cement-Faced Board Sheathing: Install rigid insulation board directly to steel studs or exterior grade sheathing at 16 inches on center with manufacturer recommended mechanical fasteners.
  - 1. Apply manufacturer's required air barrier coating to recommended thickness at all board joints, penetrations, and perimeter conditions to provide continuous air barrier and sheathing assembly.
- B. Exterior Walls Behind Veneer: Install boards horizontally on walls.
  - 1. Install in running bond pattern.
  - 2. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### **3.03 INSTALLATION - ADHERED MASONRY**

- A. Exterior Applications: Comply with TCNA (HB) Method W244E and manufacturer's instructions.
  - 1. Apply crack isolation membrane continuously to indicated substrates.

### **3.04 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.

### **3.05 PLACING AND BONDING**

- A. Remove excess pointing mortar as work progresses.
- B. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove and replace.
- C. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

### **3.06 TOLERANCES**

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- C. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- D. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

### **3.07 CUTTING AND FITTING**

- A. Cut and fit for pipes, conduit, and similar penetrating items. Coordinate with other Sections of work to provide correct size, shape, and location.

### **3.08 CLEANING**

- A. Remove excess pointing mortar and mortar smears as work progresses.
- B. Replace defective pointing mortar. Match adjacent work.
- C. Clean soiled surfaces with specified cleaning solution, at low pressure or by hand methods only; do not introduce excessive moisture into masonry wall surfaces during cleaning operations.
- D. Use non-metallic tools and stiff brushes in cleaning operations.

### **3.09 PROTECTION**

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

**END OF SECTION**

**051200**  
**STRUCTURAL STEEL FRAMING**

**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. Structural steel.
  - 2. Grout.

**1.03 DEFINITIONS**

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
  - 1. Shapes included in ASTM A 6/A 6M with flanges thicker than 2 inches.
  - 2. Welded built-up members with plates thicker than 2 inches.
  - 3. Shapes included in ASTM A 6/4 6M with flanges thicker than 1-1/2 inches included in the Seismic-Load-Resisting System.
  - 4. Connection plates and column base plates thicker than 2 inches included in the Seismic-Load-Resisting System.
- D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.
- E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System, and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Connections: Provide connections as shown or noted on Drawings. Design of connections not shown or noted shall be provided by Structural Engineer-of-Record upon request.
  - 1. Alternate connections may be submitted by the Contractor with prior approval of Structural Engineer-of-Record. Connections shall be designed for loads indicated on drawings or provided by Structural Engineer-of-Record. Loads indicated are developed using Load and Resistance Factor Design (LRFD) load combinations unless noted otherwise. One set of calculations for all alternate connections signed and sealed by a qualified engineer shall be submitted with or in advance of applicable shop drawings.
- B. Construction: Refer to the Drawings for description of lateral load resisting system.

**1.05 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop and Erection Drawings: Show location, fabrication, and assembly of structural-steel components.
  - 1. Location of each piece or detail within the structure.
  - 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 3. Include embedment piece and setting drawings.



4. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
  5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
  6. Identify members and connections of the seismic-load-resisting system.
  7. Indicate locations and dimensions of protected zones.
  8. Identify demand critical welds.
  9. Drawings submitted in multiple packages shall contain individual submittals complete with all applicable erection drawings, details, and piece drawings.
  10. Reproduction of Contract Documents is not permitted.
  11. Provide schedule for submittal of shop and erection drawings.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing.
- D. Charpy V-Notch testing results for heavy sections and weld metal when required.

#### **1.06 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer and fabricator-
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following if present on project:
  1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  2. Direct-tension indicators.
  3. Tension-control, high-strength bolt-nut-washer assemblies.
  4. Shear stud connectors.
  5. Shop primers.
  6. Nonshrink grout.
- F. Sustainability Submittals:
  1. Submit product data or other published information verifying that this product has a Type III environmental product declaration. Submit in accordance with Section 018113
  2. Product Sourcing:
    - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent post-industrial recycled material by weight.
  3. Maximum embodied carbon and recycled content of steel products. Reference drawings for embodied carbon and recycled content goals.
  4. General Contractor's Sustainability Statement Letter: In the event that a sustainability goal or submittal requirement will not be met, contractor shall state in a letter the reasons why the goal or submittal requirement is not being met. Letter shall state whether alternative sustainability measures are viable for the project. If there are viable alternates, letter shall include details of proposed alternatives and associated project costs and schedule impacts (if any) for the Owner's consideration.

#### **1.07 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.
- 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 Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- E. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC 303 -2016 as amended below:
    - a. Section 3.2: Replace entire section with the following: "Requirements for structural steel including quantities, sizes, locations, arrangement, and details shall be shown or noted in the overall Contract Drawing package. Fabricator is responsible for incorporating all such information from structural, architectural, mechanical, and electrical drawings, as well as those of other disciplines."
    - b. Section 3.5: Remove all text after first sentence.
    - c. Section 3.6: Replace entire section with the following: "When the fast-track project delivery system is selected, release of structural drawings shall constitute release for construction only if specifically noted as such on the drawing. Drawing indicated "preliminary" or "not for construction" shall not be used for detailing or construction except where the risk of any cost or delay associated with subsequent revisions to Contract Documents is accepted by the Owner, Contractor or Fabricator."
    - d. Section 4.4: Revise second sentence to read the following: "The shop and erection drawings shall be returned in accordance with the schedule defined in Division 1 of the project Specification. In the absence of such schedule, the Owner's Designated Representative for Design shall return submittals within 14 calendar days of receipt from the Owner's Designated Representative for Construction."
  - 2. AISC 341 and AISC 341s1.
  - 3. AISC 360.
  - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- F. Preinstallation Conference: Conduct conference at Project site.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. 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.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

#### **1.09 COORDINATION**

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

## **PART 2 PRODUCTS**

### **2.01 STRUCTURAL-STEEL MATERIALS**

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so total recycled content (preconsumer content plus postconsumer content, excluding home scrap) is not less than as indicated on the drawings.
- B. W-Shapes: As indicated on Drawings.
- C. Channels, Angles, Shapes: As indicated on Drawings.
- D. Plate and Bar: As indicated on Drawings.
- E. Cold-Formed Hollow Structural Sections: As indicated on Drawings.
- F. Steel Pipe: As indicated on Drawings.
  - 1. Weight Class: As indicated on Drawings.
  - 2. Finish: Black except where indicated to be galvanized.
- G. Welding Electrodes: Comply with AWS requirements, 70 Series
  - 1. Conform to Charpy V-Notch test requirements of AISC 360.
  - 2. Conform to Charpy V-Notch test requirements of AISC 341 for components included in the Seismic-Load-Resisting System.
- H. Heavy Sections:
  - 1. Conform to Charpy V-Notch test requirements of AISC 360.
  - 2. Conform to Charpy V-Notch test requirements of AISC 341 for components included in the Seismic-Load-Resisting System.

### **2.02 BOLTS, CONNECTORS, AND ANCHORS**

- A. Use Tension-Control, High-Strength Bolt-Nut-Washer Assemblies whenever possible unless indicated otherwise.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
  - 1. Finish: Plain.
- D. Steel Headed Stud Anchors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- E. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable-
  - 1. Configuration: Straight.
  - 2. Nuts: ASTM A 563 heavy-hex carbon steel.
  - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
  - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
  - 5. Finish: Plain.
- F. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.
  - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
  - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
  - 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
  - 4. Finish: Plain.
- G. Threaded Rods: ASTM A 36/A 36M.
  - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
  - 2. Washers: ASTM A 36/A 36M carbon steel.
  - 3. Finish: Plain.

- H. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.
- I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.
- K. Deformed Anchor Studs (DAS) / Deformed Bar Anchors (DBA): Made from ASTM A 108 low carbon steel, cold worked and deformed per ASTM A 1064. Minimum yield stress = 60 ksi minimum tensile strength = 80 ksi.
- L. Rebar: Rebar used for welding shall meet the requirements of ASTM A-706. Minimum bend diameters per ACI 318.
- M. Expansion Anchors, Screw Anchors, and Adhesive Anchors: Size and Manufacturer as indicated on Drawings. Complete assemblies with required rods, nuts, washers, and adhesive system as applicable. Installed in accordance with Manufacturer's installation instructions. Current ICC approval and published ICC Research Report required.
  - 1. Finish for use in conditioned environments free from potential moisture (interior): Plain or in accordance with Manufacturer's standard.
  - 2. Finish for use in exposed or potentially wet environments and for attachment of exterior cladding materials: Galvanized in conformance with ASTM A 153 or stainless steel, Series 316.
  - 3. Finish for use in exposed to ocean or waterfront type 316 stainless steel.

### 2.03 PRIMER

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Primer: Where steel is to be field painted, provide fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20

### 2.04 GROUT

- A. 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. Minimum compressive strength = 6000 psi
- B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. Minimum compressive strength = 6000 psi. Required where grout is exposed to view or weathering.

### 2.05 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
  - 1. Camber structural-steel members where indicated.
  - 2. Fabricate beams with rolling camber up.
  - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
  - 4. Mark and match-mark materials for field assembly.
  - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations, if applicable.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces. Do not enlarge bolt holes by burning.

- 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 2, "Hand Tool Cleaning or SSPC-SP 3, "Power Tool Cleaning."
- F. Steel Headed Stud Anchors and Deformed Anchor Studs / Deformed Bar Anchors: Prepare steel surfaces as recommended by manufacturer of anchors. Use automatic end welding of anchors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
  - 1. Cut, drill, thermal cut, or punch holes perpendicular to steel surfaces.
  - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
- H. Splices: Splicing of members to obtain required lengths is not permitted without prior approval of structural Engineer-of-Record unless indicated on the Drawings.
- I. Substitutions: Where exact sizes and weights indicated on Drawings are not readily available, secure approval of alternate sizes from Structural Engineer-of Record in time to prevent project delay.

## **2.06 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: As indicated on Drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

## **2.07 SHOP PRIMING**

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded, including top flange of beams to receive steel headed stud anchors.
  - 3. Surfaces to be high-strength bolted with slip-critical connections.
  - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  - 5. Galvanized surfaces.
  - 6. Surfaces not otherwise indicated to be painted that are not exposed to view or weather in the final condition.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to either of the following specifications and standards:
  - 1. SSPC-SP 2, "Hand Tool Cleaning."
  - 2. 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 minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection.

## **2.08 GALVANIZING**

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes in closed sections (HSS or Pipe) that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles located in exterior walls.

## **2.09 SOURCE QUALITY CONTROL**

- A. Testing and Inspection: As indicated on Drawings.
  - 1.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 PREPARATION**

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
  1. Coordinate installation of non-structural steel items that load the temporarily supported steel frame such that temporary supports are adequate to resist all imposed loads.
  2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
  3. Do not apply permanent loading other than the weight to supported concrete slab-on-deck assemblies to composite beams and girders until concrete has achieved 75 percent of its design strength without prior approval of structural Engineer-of-Record.

### **3.03 ERECTION**

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  1. Set plates for structural members on wedges, shims, or setting nuts as required.
  2. Weld plate washers to top of baseplate where indicated on Drawings.
  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 plate before packing with grout.
  4. Clean and moisten surfaces to receive grout. Immediately remove any remaining free water. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  1. Level and plumb individual members of structure.

2. Make allowances for difference between temperature at time of erection and mean temperature of 70° F when structure is completed and in service.
- E. Splice members only where indicated.
    1. Fasten splices in compression after bearing surface have been brought into contact. Close all gaps greater than 1/16" by driving non-tapered mild steel shims full depth of bearing surface along full length of gap.
  - F. Do not use thermal cutting during erection unless approved by Structural Engineer-of-Record. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
  - G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
  - H. Steel Headed Stud Anchors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

### **3.04 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: As indicated on Drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  2. Remove backing bars or runoff tabs where indicated on Drawings, back gouge, and grind steel smooth.
  3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

### **3.05 FIELD QUALITY CONTROL**

- A. Testing and Inspection: As indicated on Drawings.

### **3.06 REPAIRS AND PROTECTION**

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" Section 099123 "Interior Painting."

### **END SECTION**

**SECTION 054300**  
**SLOTTED CHANNEL FRAMING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Slotted channel framing system for use within Pool Mechanical Building as delineated on Drawings.
  - 1. Hangers and supports for facility services outside Pool Mechanical Building are as specified in Divisions 21 through 28.
- B. Accessories.
- C. Engineering design of framing system and connections to building structure.

**1.02 REFERENCE STANDARDS**

- A. 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.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- D. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

**1.03 SUBMITTALS**

- A. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

**1.04 QUALITY ASSURANCE**

- A. Designer Qualifications: Design slotted channel framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in California.

**1.05 WARRANTY**

- A. Manufacturer Warranty: Provide 10-year manufacturer warranty for protective coating performance. Complete forms in Owner's name and register with manufacturer.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acceptable Manufacturer:
  - 1. Unistrut Corporation: [www.unistrut.com](http://www.unistrut.com).

**2.02 SLOTTED CHANNEL FRAMING**

- A. Design framing system to and connections to building structure to carry static and dynamic loads imposed on framing system; limit framing member deflection to recommendations of framing system manufacturer.

**2.03 MATERIALS**

- A. Slotted Channel Framing: ASTM A653/A653M Grade 33 or ASTM A1011/A1011M Grade 33.
  - 1. Primary Framing Member Profile: Size as required to support indicated equipment and piping/conduit; square, with holes on channel legs.
  - 2. Corrosion-Resistant Finish: Specified manufacturer's Atkore Defender finish system.
- B. Slotted Channel Fittings: ASTM A1011/A1011M.
  - 1. Finish: Match channel framing.



- C. Fasteners: As detailed or required for indicated applications; manufacturer's standard fasteners designed specifically for specified system.
  - 1. Finish: Galvanized.
- D. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.
- E. Threaded Rod: ASTM A307; threaded full length of rod; minimum 1/2 inch diameter, or as required to suit design requirements.
  - 1. Finish: Galvanized.
- F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

#### **2.04 FABRICATION**

- A. Fit and field assemble items in largest practical sections.
- B. Fabricate items with joints tightly fitted and secured.
- C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- D. Supply components required for anchorage of framing components. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

#### **2.05 FINISHES**

- A. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.
- B. Special Corrosion-Resistant Finish: Manufacturer's standard thermosetting polyester or acrylic urethane powder coating; minimum cured-film thickness of 1.5 mils.
  - 1. Color: As selected from manufacturer's full or custom range.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

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

#### **3.02 PREPARATION**

- A. 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. Obtain approval prior to site cutting or making adjustments not scheduled.
- D. After erection, repair and refinish abrasions to match specified finish for each component.

#### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch in 10 feet, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

**SECTION 055000**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Shop fabricated steel items, including:
  - 1. Wall-mounted countertop supports.
  - 2. Plastic fabricated bench supports.
  - 3. Outdoor changing stalls.
  - 4. Metal guardrails.
  - 5. Other items as specified in this Section and as indicated on Drawings.

**1.02 REFERENCE STANDARDS**

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- F. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing.
- G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- I. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel.
- J. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
- K. SSPC-SP 2 - Hand Tool Cleaning.

**1.03 SUBMITTALS**

- A. 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.

**1.04 QUALITY ASSURANCE**

- A. Fabricator Qualifications:
  - 1. A company specializing in manufacturing products specified in this Section, with not less than ten years of documented experience.

**PART 2 PRODUCTS**

**2.01 MATERIALS - STEEL**

- A. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- B. Plates: ASTM A283/A283M.
- C. Stainless Steel, General: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A554, Type 304, 16 gauge, 0.0625 inch minimum metal thickness, 1-1/2 inch diameter.
- E. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.
- F. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
  - 1. Stainless Steel: AWS D1.6/D1.6M.

## 2.02 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.
  - 1. Comply with NOMMA voluntary guidelines for joint finishes; Finish #2 - completely sanded joint, some undercutting and pinholes acceptable.
- E. Provide for thermal expansion/contraction of exterior metal railings and similar linear fabrications exceeding 30 feet in running length; and not closer than 24 inches from corners and intersections.
- F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- G. Tubular and Hollow Fabrications: Fabricate with open ends or 1/8 inch diameter drilled holes for moisture weepage, unobtrusively located and concealed from view wherever possible.
- H. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

## 2.03 FABRICATED ITEMS

- A. Provide and install items shown on Drawings with anchorage and attachments necessary for installation.
- B. The following is a list of principal items only. Refer to Drawing details for items not specifically scheduled:
  - 1. Countertop Supports: Stainless steel square tube, as detailed; No 4 finish.
  - 2. Plastic Fabricated Bench Supports: Stainless steel square tube, as detailed; No 4 finish.
  - 3. Outdoor Changing Stalls: As detailed; powder coat finish.
  - 4. Guardrails: As detailed; galvanized finish.

## 2.04 FINISHES - STEEL

- A. General:
  - 1. Prepare surfaces to be primed in accordance with SSPC-SP 2, or as recommended by finish coating manufacturer.
  - 2. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Prime paint all steel items, unless otherwise specified.
  - 1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
  - 2. Prime Painting: One coat.
- C. Powder Coat Finish: Electrostatically applied, heat cured, thermoset polymer coating system that meets or exceeds following minimum performance criteria:
  - 1. Top Coat Powder Type: Polyester; TGIC (triglycidyl isocyanurate crosslinker) free.
  - 2. Performance:
    - a. Exterior Applications: Super durable polyester; comply with performance requirements of AAMA 2604.
  - 3. Dry Film Thickness: Minimum 2.5 mils.
  - 4. Color: As selected from manufacturer's full or custom range.
  - 5. Acceptable Manufacturer:
    - a. IFS Coatings: [www.ifscoatings.com](http://www.ifscoatings.com).
    - b. Substitutions: See Section 016000 - Product Requirements.
- D. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.
  - 1. Hollow Ferrous Metal Fabrications: Where metal fabrications have hollow, internal surfaces that are to be galvanized, fabricate such items with holes in fabrications to allow galvanizing to be applied to all internal surfaces; locate holes in unobtrusive locations when fabrications are installed in final position.

## 2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.

- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

### **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. Furnish 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.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.

#### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

**SECTION 055100**  
**METAL STAIRS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Prefabricated stairs, including:
  - 1. Alternating tread stairs.

**1.02 REFERENCE STANDARDS**

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].

**1.03 SUBMITTALS**

- A. Product Data: Provide manufacturer's product data for prefabricated metal stair assemblies, indicating all specified features.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
  - 1. Include the design engineer's seal and signature on each sheet of shop drawings.

**PART 2 PRODUCTS**

**2.01 PREFABRICATED STAIRS**

- A. Alternating Tread Stairs: Welded metal unit; factory fabricated to the greatest degree possible.
  - 1. Materials: Aluminum; ASTM B221 (ASTM B221M), 6063 alloy, T52 temper.
    - a. Stair Angle: 56 degrees, unless otherwise indicated on Drawings.
    - b. Components: Manufacturer's standard handrails, guardrails, non-skid treads and stringers.
    - c. Finish: Manufacturer's standard safety yellow powder coat.
    - d. Accessories: Manufacturer's standard foot divider with rubber bumper strip.
  - 2. Acceptable Manufacturers:
    - a. Lapeyre Stair, Inc.; Alternating Tread Stair: [www.lapeyrestair.com](http://www.lapeyrestair.com).
    - b. Precision Ladders, LLC; Aluminum Alternating Tread Stairs: [www.precisionladders.com/#sle](http://www.precisionladders.com/#sle).

**PART 3 EXECUTION**

**3.01 EXAMINATION**

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

**3.02 PREPARATION**

- A. Supply items required to be cast into concrete and 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 and angles 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. Obtain approval prior to site cutting or creating adjustments not scheduled.

**3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

**END OF SECTION**

**SECTION 055133**  
**METAL LADDERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Prefabricated ladders, including:
  - 1. Prefabricated wall and surge tank ladders.

**1.02 REFERENCE STANDARDS**

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
- D. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.

**1.03 SUBMITTALS**

- A. Product Data: Provide manufacturer's product data for prefabricated metal ladder assemblies, indicating all specified features.
- B. Shop Drawings:
  - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

**1.04 WARRANTY**

- A. Manufacturer Warranty: Provide 5-year manufacturer warranty for material and workmanship. Complete forms in Owner's name and register with manufacturer.

**PART 2 PRODUCTS**

**2.01 MATERIALS - ALUMINUM**

- A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6061 alloy, T6 temper.
- D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.
- E. Bolts, Nuts, and Washers: Stainless steel.

**2.02 PREFABRICATED LADDERS**

- A. Prefabricated Wall Ladders: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
  - 1. Components: Manufacturer's standard rails, rungs, treads, handrails, returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
  - 2. Mounting Brackets: Provide intermediate and extended brackets as required for each indicated wall condition.
  - 3. Materials: Aluminum; 6063 alloy, T52 temper.
  - 4. Finish: Mill finish aluminum.
  - 5. Acceptable Product:
    - a. O'Keeffe's Inc.; Model 500: [www.okeeffes.com/#sle](http://www.okeeffes.com/#sle).

**2.03 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

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

**3.02 PREPARATION**

- A. 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.

**3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

**055313**  
**BAR GRATINGS**

**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 metal bar gratings and metal frames and supports for gratings.
- B. Related Requirements:
  - 1. Section 051200 "Structural Steel Framing" for structural-steel framing system components.

**1.03 COORDINATION**

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

**1.04 ACTION SUBMITTALS**

- A. Product Data: For the following:
  - 1. Clips and anchorage devices for gratings.
  - 2. Paint products.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For gratings, including manufacturers' published load tables

**1.05 INFORMATIONAL SUBMITTALS**

- A. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

**1.06 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 3. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
  - 4. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

**1.07 FIELD CONDITIONS**

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. McNichols or approved equal



## 2.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design gratings.
- B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Floors: Uniform load of 125 lbf/sq. ft. or concentrated load of 2000 lbf, whichever produces the greater stress.
  - 2. Limit deflection to L/360 or 1/4 inch, whichever is less.
- C. Seismic Performance: Gratings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. Component Importance Factor: 1.0.

## 2.03 METAL BAR GRATINGS

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual" and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."
- B. Welded Steel Grating:
  - 1. Bearing Bar Spacing: 1-3/16 inches or as required to comply with structural performance requirements.
  - 2. Bearing Bar Depth: As required to comply with structural performance requirements.
  - 3. Bearing Bar Thickness: As required to comply with structural performance requirements.
  - 4. Crossbar Spacing: 4 inches o.c.
  - 5. Grating Mark W-19-4 (1-1/2 x 3/16) STEEL: 1-1/2-by-3/16-inch bearing bars at 1-3/16 inches o.c., and crossbars at 4 inches o.c.
  - 6. Grating Mark: As indicated.
  - 7. Traffic Surface: As indicated.
  - 8. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface.

## 2.04 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Bars for Bar Gratings: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.
- C. Wire Rod for Bar Grating Crossbars: ASTM A510.
- D. Uncoated Steel Sheet: ASTM A1011/A1011M, structural steel, Grade 30.
- E. Galvanized-Steel Sheet: ASTM A653/A653M, structural quality, Grade 33, with G90 coating.
- F. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A240/A240M, Type 304.
- G. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.

## 2.05 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1.
- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Post-Installed Anchors: Torque-controlled expansion or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
  1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
  2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

## 2.06 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

## 2.07 FABRICATION

- A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Welding: Comply with AWS recommendations and the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated, coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
  1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
  2. Fabricate toeplates for attaching in the field.
  3. Toeplate Height: 4 inches unless otherwise indicated.
- G. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
  1. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.

2. Provide no fewer than four saddle clips for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.
  3. Provide no fewer than four weld lugs for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced less than 15/16-inch o.c., with each lug shop welded to three or more bearing bars. Interrupt intermediate bearing bars as necessary for fasteners securing grating to supports.
  4. Provide no fewer than four flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars.
  5. Furnish threaded bolts with nuts and washers for securing grating to supports.
  6. Furnish self-drilling fasteners with washers for securing grating to supports.
  7. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.
- H. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.
- I. Do not notch bearing bars at supports to maintain elevation.

## **2.08 GRATING FRAMES AND SUPPORTS**

- A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
1. Unless otherwise indicated, fabricate from same basic metal as gratings.
  2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- B. Galvanize steel frames and supports in the following locations:
1. Exterior.
  2. Interior, where indicated.

## **2.09 ALUMINUM FINISHES**

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I.

## **2.10 STEEL FINISHES**

- A. Finish gratings, frames, and supports after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- C. Shop prime gratings, frames, and supports not indicated to be galvanized unless otherwise indicated.
1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning." requirements indicated below:
1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  4. Other Items: SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

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

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION, GENERAL**

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- D. Fit exposed connections accurately together to form hairline joints.
  - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Attach toeplates to gratings by welding at locations indicated.
- F. Field Welding: Comply with AWS recommendations and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
- G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

#### **3.02 INSTALLING METAL BAR GRATINGS**

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

#### **3.03 ADJUSTING AND CLEANING**

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

### **END OF SECTION**

**061000**  
**ROUGH CARPENTRY**

**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. This Section includes the following:
  - 1. Framing with dimension lumber.
  - 2. Framing with timber.
  - 3. Framing with engineered wood products.
  - 4. Metal fabrications used to support wood members including bearing plates, anchor bolts, and weldments.
  - 5. Rough hardware, including but not limited to metal framing anchors, columns caps and bases, hangers, straps, bolts, screws, and nails.
- B. Related Sections include the following:
  - 1. Division 06 Section "Structural Sheathing."
  - 2. Division 06 Section "Shop-Fabricated Wood Trusses."
  - 3. Prefabrication of panels off site is a Contractor's option. Design details are based on traditional framing on site. Panelized construction shall be structurally equivalent or superior to the work and details shown on the Contract Documents.

**1.03 DEFINITIONS**

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
  - 2. NLGA: National Lumber Grades Authority.
  - 3. RIS: Redwood Inspection Service.
  - 4. SPIB: The Southern Pine Inspection Bureau.
  - 5. WCLIB: West Coast Lumber Inspection Bureau.
  - 6. WWPA: Western Wood Products Association.

**1.04 SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
  - 1. Wood-preservative-treated wood.
  - 2. Engineered wood products.
  - 3. Power-driven fasteners.

4. Powder-actuated fasteners.
  5. Expansion anchors.
  6. Metal framing anchors.
- E. Shop Drawings: Submit shop drawings for all metal framing connectors and weldments showing dimensions, material type and thickness, hole sizes and locations and fastener sizes and lengths, weld sizes and lengths, and finishes. Submit manufacturer's catalog information and installation instructions for all metal framing connections.
- F. Layout Drawings: Submit layout drawings for all hold-down anchor bolts and sill plate anchor bolts embedded in concrete or masonry. Indicate anchor bolts, lengths and dimensions from edge of foundation wall or grid. Describe means and methods used to ensure hold-down anchor bolts are correctly located, to ensure anchor bolts will not be moved during concreting, and to ensure anchor bolts locations in hardened concrete are within specified tolerance in plan and in plumbness.
- G. Submit Manufacturer's data and/or certification verifying:
1. Plywood and OSB conformance to the product standards listed herein.
  2. Fabricated lumber conformance to design properties noted on the drawings.
- H. Nails: Submit 2 samples of each nail proposed to be used on the project. Include sample of nails for mechanical connectors. Attach to each nail sample a written description including manufacturer, ASTM reference, designation, type, diameter, length, and finish. Submit sizes and types of all pneumatically or mechanically driven nails proposed for use, along with code approved report showing equivalent allowable loads to specified nails. Submit metal framing connector manufacturer's requirements for using pneumatically or mechanically driven nails or their products.
- I. Certification: Submit certification that all beams and stringers used in cantilevers or continuous spans are graded to provide the full allowable stresses over the entire member length.
- J. Wood Moisture Content: Submit test results of wood moisture content for all dimension lumber. Lumber shall be tested at time of installation.
- K. Panelized Construction: If used, submit shop drawings of each panel listing dimensions, materials, grades, tolerances, and fastening. Submit placing drawings for all panels showing location, fastening, and connections at all sides of all panels. Provide details at all panel edges. Demonstrate how construction is equal or superior to all details on the Contract Documents.

#### **1.05 QUALITY ASSURANCE**

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
- C. Wood Framing: Comply with requirements of the The Governing Building Code noted on the drawings and National Design Specification for Wood Construction.
- D. Structural capacities for structural composite lumber shall be established and monitored in accordance with ASTM D5456.
- E. Joist hangers and other metal connectors shall comply with ASTM D1761.
- F. Preinstallation Conference: Contractor shall hold a preinstallation conference prior to erecting wood framing Contractor, Superintendent, Foreman, Engineer, Architect, and Testing Agency shall attend.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

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

## **PART 2 PRODUCTS**

### **2.01 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  - 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  - 1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

### **2.02 WOOD-PRESERVATIVE-TREATED LUMBER**

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
  - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Unless naturally durable wood recognized by the building code is specified, treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  - 2. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  - 3. Wood sub-floor, joists, girders, and posts in framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas where the wood joists are closer than 18 inches or the wood girder is closer than 12" to the exposed ground.
  - 4. Wood floor plates, sleepers, and sills that are installed over concrete slabs-on-grade.
  - 5. Wood sheathing and framing members that rest on exterior foundation walls and are less than 8" from exposed earth.

6. Wood posts or columns supported on a concrete slab or footing in direct contact with earth unless the post/column is supported by a metal pedestal projecting at least 1" above the slab/footing and at least 6" above exposed earth.
7. Wood structural supports for building, balconies, porches and similar elements exposed to the weather without adequate protection from roof, eave, overhang, or other covering that would minimize moisture and water accumulation on the surface or at joints between members.

### **2.03 DIMENSION LUMBER FRAMING**

- A. Maximum Moisture Content: 19 percent for members 4x and smaller.
- B. Species and grade as noted on the drawings.

### **2.04 TIMBER FRAMING**

- A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:
  1. Species Grade and Design Stresses: As noted on the drawings.
  2. Additional Restriction: Free of heart centers.

### **2.05 ENGINEERED WOOD PRODUCTS**

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde. Required design values are noted on the drawings.
- B. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde. Required design values are noted on the drawings.
- C. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055. Required design values are noted on the drawings.
  1. Provide I-joists manufactured without urea formaldehyde.
  2. Web Material: Either oriented strand board or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
  3. Structural Properties: Provide units with depths and design values not less than those indicated.
- D. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists. Required design values are noted on the drawings.

### **2.06 MISCELLANEOUS LUMBER**

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
- B. For concealed boards, provide lumber with 19 percent maximum moisture content.

### **2.07 FASTENERS**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  1. Where rough carpentry is pressure-preservative treated, provide fasteners of 300 series stainless steel and use stainless steel fasteners in stainless steel hardware. Where rough carpentry is exposed or in area of high relative humidity provide fasteners with hot-dip



galvanized zinc coating complying with ASTM A153, Class D. All other fasteners shall be electro-galvanized meeting ASTM A641 "Regular Coating". Fasteners include all accessories such as washers and nuts.

- B. Nails: Nails shall be "Engineered Construction Nails" in accordance with ASTM F1667. Use box or common wire nail lengths and diameters noted. Threaded, hardened steel nails may be substituted for box or common size nails of corresponding size. Use ring shank or screw shank nails for attachment of plywood and OSB.
  - 1. Pneumatically or mechanically driven nails shall be subject to a jobsite testing to qualify equipment and personnel. Test shall demonstrate that nailing is achieved without over driving of nails and with proper spacing and edge distance. If jobsite testing is acceptable to the Architect, and if shown to be equivalent to box wire nail allowable loads in accordance with CABO report number NER-272 or equivalent code approval report, machine nails may be substituted for hand driven nails. Use of machine nails is subject to written approval of the Architect.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1. Wood Screws: Cut or rolled thread wood screws meeting the requirements of ANSI/ASME Standard B19.6.1. Provide corrosion resistant coating equivalent to hot dip galvanizing.
- E. Lag Bolts: ASTM A307 hex head. Hot dip galvanized with hot dip galvanized washers.
- F. Bolts and Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex heads and nuts except anchor bolts shall have heavy hex heads where indicated, and flat washers.
- G. Washers: Provide steel washers under all bolt and lag bolt heads and nuts bearing against wood. Use hot-dip galvanized malleable iron washers when washer is exposed to view. Surface area of washer to be minimum of 16 times the shank area of the receiving bolt or lag screw. Thickness not less than 1/10 of the washer diameter or length of longest side. Use beveled washers where the bolt to member alignment is not perpendicular. Use plate washers under steel washer at sill and sole plates.
- H. Steel Plates, Straps, and Weldments: Size as indicated. Where welded, provide minimum of 3/16" fillet welds all sides and full length of contact surfaces unless noted. Use E70 welding electrodes. If exposed and within reach of public, grind all exposed edges and corners to 1/8" radius and remove all sharp edges. Prime with shop paint. Use ASTM A36 material, Use 300 series stainless steel for materials in contact with pressure preservative treated wood. Hot-dip galvanized after fabrication.
- I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

## **2.08 METAL FRAMING ANCHORS**

- A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

- C. General: Provide with maximum number nails, bolts, and/or screws allowed for each connector according to Manufacturer. Provide nails, bolts, screws of size, length, and finish specified by the Manufacturer. Gun nails shall not be used for connector nailing without prior written approval. Connector fastener requirements shall be stamped or labeled directly on the connector.
- D. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
  - 1. Use for interior locations where stainless steel is not indicated.
- E. Stainless-Steel Sheet: ASTM A 666, Type 316.
  - 1. Use for exterior locations and for connectors in contact with pressure preservative treated wood. Fasteners shall also be stainless steel.
- F. Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.
- G. I-Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch- wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.
- H. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
- I. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.
- J. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover.
- K. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
- L. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below unless noted otherwise.
- M. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs.
- N. Hold-Downs: Brackets for bolting to wall studs and securing to foundation

## **2.09 MISCELLANEOUS MATERIALS**

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
  - 1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Structural Adhesives: Comply with APA AFG – 01.
- E. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION, GENERAL**

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

attaching other construction. Studs shall have full bearing on sill and sole plates. All wood columns and posts shall be framed to have full end bearing.

- B. Fit members together accurately without trimming cutting or other unauthorized modification. Members shall be accurately assembled to lines and elevations indicated on approved shop drawings and Contract Documents. The various members forming parts of a complete frame or structure, after being assembled, shall be aligned and adjusted accurately before being fastened. Clean bearing surfaces which will be in permanent contact before members are assembled. No drifting or cutting to enlarge unfair holes will be allowed. Provide temporary supports, bracing and anchorage as required to hold members in place until permanently secured.
- C. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- E. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- F. Do not splice structural members between supports.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
  - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
  - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
  - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
  - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- I. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- J. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- K. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.
- L. Fasteners
  - 1. Use common box wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated. Where splitting is likely to occur, prebore nail holes 1/2 size of nail diameter and use threaded, hardened

steel nails. Nail heads shall be installed flush with sheathing. Do not overdrive. Provide 3/8" minimum edge distance to all sheathing edges.

2. Wood Screws: Prebore holes before installing. Hole diameter and installation shall satisfy the NDS. It is acceptable lubricate screw with soap before installing.
3. Bolts (Including Anchor Bolts and Hold-down Bolts): Bolt holes shall be 1/32" minimum and 1/16" maximum larger than the bolt diameter. Carefully center bolt hole between side plates and main members. Provide steel washers between wood and bolt heads and/or nuts. Countersink heads flush where heads would otherwise protrude into finish materials. Bolted connections shall be snugly tightened, but not to the extent of crushing wood under washers. Damage threads to prevent nuts from loosening.
4. Lag Screws: Provide steel washer between wood and screw head. Provide lead holes for the screw portion as follows:

<u>Lag Screw Nominal Diameter</u>	<u>Lead Hole Diameter</u>
1/2 in. dia.	5/16 in. dia.
3/4 in. dia.	1/2 in. dia.
1 in. dia.	3/4 in. dia.

- a. Clearance hole for the shank shall have a diameter equal to the unthreaded portion of the screw shank and shall have the same depth of penetration as the length of the unthreaded shank. It is acceptable to lubricate screw with soap before installing.
- M. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Comply with indicated fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.

### **3.02 WALL AND PARTITION FRAMING INSTALLATION**

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction.
  1. Provide continuous horizontal blocking at mid-height of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

### **3.03 FLOOR JOIST FRAMING INSTALLATION**

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
  1. Where supported on wood members, by using metal framing anchors.
  2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Masonry/Concrete Bearing: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches. Provide 1/2" clear at sides, top and end for all wood member ends entering masonry or concrete walls.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- D. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

- F. Unless noted otherwise, anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to 3 joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.
- G. Provide solid blocking between joists under jamb studs for openings.
- H. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
  - 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- I. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
  - 1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- size lumber, double-crossed and nailed at both ends to joists.
  - 2. Steel bridging installed to comply with bridging manufacturer's written instructions.

### **3.04 CEILING JOIST AND RAFTER FRAMING INSTALLATION**

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
  - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- size or 2-by-4-inch nominal- size stringers spaced 48 inches o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
  - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
  - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

### **3.05 TIMBER FRAMING INSTALLATION**

- A. Install timber with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members, unless otherwise indicated; tie together over supports as indicated if not continuous.
- B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space at sides and ends of wood members.
- C. Install wood posts using metal anchors indicated.
- D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

### **3.06 STAIR FRAMING INSTALLATION**

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
  - 1. Stringer Size: 2-by-12-inch nominal- size, minimum.
  - 2. Stringer Material: Laminated-veneer lumber.

3. Notching: Notch stringers to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
  4. Stringer Spacing: At least 3 stringers for each 36-inch clear width of stair.
- B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

### 3.07 WOOD INSTALLATION TOLERANCES

- A. Sills: Concrete supporting sill plates shall be cast level to within 1/16" in 6'.
- B. Wall Studs and Headers:
1. Location along wall length: +/- 1/4"
  2. Location perpendicular to wall and plan location: +/- 1/8"
  3. Plumb: 1/4" in 10', maximum of 1" total over building height,
  4. Length: +/- 1/8" (shim all gaps at top or bottom of bearing wall studs).
- C. Floor and Roof Framing:
1. Location in plan +/- 1/4" for joists and metal plate connected wood trusses not at a building edge, +/- 1/8" for joists, metal plate connected wood trusses, rimboard, blocking, etc. at building edges.
  2. Levelness: +/- 1/4" in 10' and no more than 1/8" between adjacent floor members
- D. Shear Wall Posts:
1. Location along wall length: +/- 1/8"
  2. Location perpendicular to wall and wall overall location from specified location: +/- 1/8"
  3. Plumb and length: same as wall studs
- E. Exposed Columns:
1. Plan location: +/- 1/8"
  2. Plumbness: +/- 1/4" in 10, 1/2" total over height of column
  3. Elevation: +/- 1/4" of specified elevation

### 3.08 FIELD QUALITY CONTROL

- A. The completed work shall be inspected by the Owner's inspection/testing agency prior to covering the work. The following inspections are required:
1. Prior to the start of the work, review the Contractor's quality control procedures. Review the scope and frequency of inspections.
  2. Review Fabricator's quality control procedures for all fabricated lumber, connectors, and weldments prior to fabrication for the project. This includes all products in the section as well as Wood Decking and Press-Plate Wood Trusses.
  3. Inspect all lumber for conformance of the Contract Documents. Check moisture content of all pressure preservative treated lumbar and all members 5x and larger and of 10% of other members.
  4. Inspect all members for size, placement, and connection details. Inspect blocking, bridging, and bracing. Verify proper connection hardware, proper size, length, and finish of connector fasteners and their installation. Inspect for specified bearing. Inspect from Contract Documents and approved submittals.
  5. Inspect and test all welds in fabricate steel pieces. Inspect 100% visual and 10% magnetic particle. Full penetration welds shall be ultrasonically inspected.
  6. Shearwalls, diaphragms, and hold downs:
    - a. Inspect thickness and grade of wood structural panels, blocking, hold-down anchors, and all other metal connectors, minimum size of panels, and the edge and field nailing of the wood structural panel to the framing for conformance to the approved submittals and Construction Documents. Review panelized construction for proper wood structural panel overlaps and connectors.
  7. Metal Plate Connected Wood Trusses:

- a. Inspect size and location of metal plates, bolts, or other connection devices, conformance to approved submittals and the Construction Documents. Verify that nails, bolts, hold-down anchors and all other metal connectors or other devices are tight and otherwise properly installed. Verify that permanent web bracing, including x-bracing, has been installed.
8. Fabricated Lumber:
  - a. Inspect grade, nailing, end bearing, end attachment, size, spacing, bridging, and stamp listing code approval for conformance to approved submittals and the Construction Documents
9. Anchor Bolts:
  - a. Verify that anchor bolts have been placed, have proper plate washers, are correctly tightened, and are located within tolerance.
10. Expansion and Adhesive Bolts: Inspect and test as indicated on the drawings.

**END SECTION**

**SECTION 061053**  
**MISCELLANEOUS ROUGH CARPENTRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Non-structural, miscellaneous rough carpentry items, including:
  - 1. Preservative treated wood materials.
  - 2. Fire retardant treated wood materials.
  - 3. Communications and electrical room mounting boards.
  - 4. Concealed wood blocking, nailers, and supports.
  - 5. Miscellaneous wood framing and furring.

**1.02 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood.
- D. PS 1 - Structural Plywood.
- E. PS 20 - American Softwood Lumber Standard.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate installation of rough carpentry members specified in other sections.

**1.04 SUBMITTALS**

- A. Product Data: Provide technical data on wood preservative materials and application instructions.

**1.05 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, and installation.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. Species: Douglas Fir-Larch or Hem-Fir.
  - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee ([www.alsc.org](http://www.alsc.org)) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

**2.02 DIMENSION LUMBER**

- 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. Communications and Electrical Room Mounting Boards: PS 1, A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Other Applications:
  - 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
  - 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
  - 3. 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. 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. Interior Type: 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. Interior rough carpentry items are to be fire retardant treated.
    - c. Treat rough carpentry items as indicated on Drawings.
    - d. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
  - 1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.10 lb/cu ft retention, minimum.
    - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
    - b. Treat lumber in contact with roofing, flashing, or waterproofing.
    - c. Treat lumber in contact with masonry or concrete.
    - d. Treat lumber less than 18 inches above grade.
    - e. Treat lumber in other locations as indicated on Drawings.

## 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 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.
- C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- D. Provide the following specific nonstructural framing and blocking:
  - 1. Cabinets and shelf supports.
  - 2. Handrails.
  - 3. Other items as indicated on Drawings.

### **3.03 ROOF-RELATED CARPENTRY**

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

### **3.04 INSTALLATION OF CONSTRUCTION PANELS**

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on edges and into studs in field of board.
  - 1. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
  - 2. Install adjacent boards without gaps.
  - 3. Size and Location: As indicated on Drawings.

### **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. Waste Disposal:
  - 1. Comply with applicable regulations.
  - 2. Do not burn scrap on project site.
  - 3. Do not burn scraps that have been pressure treated.
  - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

**END OF SECTION**

**SECTION 061516  
WOOD ROOF DECKING**

**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 solid-sawn wood roof decking
- B. Related Requirements:
  - 1. Section 061000 "Rough Carpentry" for dimension lumber items associated with wood roof decking.

**1.03 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. For preservative-treated wood products, include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Schedule delivery of wood roof decking to avoid extended on-site storage and to avoid delaying the Work.
- B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood roof decking with surfaces that are to be exposed in the final Work protected from exposure to sunlight.

**PART 2 PRODUCTS**

**2.01 WOOD ROOF DECKING, GENERAL**

- A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.

**2.02 SOLID-SAWN WOOD ROOF DECKING**

- A. Standard for Solid-Sawn Wood Roof Decking: Comply with AITC 112.
- B. Roof Decking Species: Douglas fir-larch or Douglas fir-larch (North).
- C. Roof Decking Nominal Size: 1 by 4
- D. Roof Decking Grade: Commercial Decking or Commercial Dex.
- E. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that are not exposed to view.
- F. Moisture Content: Provide wood roof decking with 15 percent maximum moisture content at time of dressing.
- G. Face Surface: Smooth.
- H. Edge Pattern: Vee grooved.

**2.03 PRESERVATIVE TREATMENT**

- A. Pressure treat wood roof decking according to AWPA U1; Use Category UC2.
- B. Preservative Chemicals: Inorganic boron (SBX).
  - 1. For exposed items indicated to receive a stain
- C. Use process that includes water-repellent treatment.

- D. After treatment, redry materials to 15 percent maximum moisture content.

#### **2.04 ACCESSORY MATERIALS**

- A. Fasteners for Solid-Sawn Roof Decking: Provide fastener size and type complying with AITC 112 for thickness of deck used.
- A. Fastener Material: galvanized steel.

#### **2.05 FABRICATION**

- A. Shop Fabrication: Where preservative-treated roof decking is indicated, complete cutting, trimming, surfacing, and sanding before treating.
- B. Apply indicated finish materials to comply with Section 099300 "Staining and Transparent Finishing" in fabrication shop.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine walls and support framing in areas to receive wood roof decking for compliance with installation tolerances and other conditions affecting performance of wood roof decking.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A. Install solid-sawn wood roof decking to comply with AITC 112.
  - 1. Locate end joints for lay-up indicated.
- B. Anchor wood roof decking, where supported on walls, with bolts as indicated.
- C. Where preservative-treated roof decking must be cut during erection, apply a field-treatment preservative to comply with AWWA M4.
  - 1. For solid-sawn roof decking, use inorganic boron (SBX).
- D. Apply joint sealant to seal roof decking at exterior walls at the following locations:
  - 1. Between roof decking and supports located at exterior walls.
  - 2. Between roof decking and exterior walls that butt against underside of roof decking.
  - 3. Between tongues and grooves of roof decking over exterior walls and supports at exterior walls.

#### **3.03 ADJUSTING**

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged roof decking if repairs are not approved by Architect.

#### **3.04 PROTECTION**

- A. Provide water-resistive barrier over roof decking as the Work progresses to protect roof decking until roofing is applied.
- B. If, despite protection, inorganic boron (SBX)-treated roof decking becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

### **END OF SECTION**

**061600  
SHEATHING**

**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. This Section includes the following:
  - 1. Wall sheathing.
  - 2. Roof sheathing.
- B. Related Sections include the following:
  - 1. Division 06 Section "Rough Carpentry" for plywood backing panels.

**1.03 SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
  - 1. Preservative-treated plywood.

**1.04 QUALITY ASSURANCE**

- A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
  - 1. Plywood.
  - 2. Oriented strand board.

**1.05 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 WOOD PANEL PRODUCTS, GENERAL**

- A. Plywood: Conform to product standard PS1-latest edition and APA Plywood Design specifications PDS latest edition. Provide exposure 1 except where surface or edge of plywood will be exposed to weather, then use exterior grade.
- B. Oriented Strand Board: Conform to product standard PS2 and APA design specification PRP108. Provide Exposure 1 rated panels. Do not use oriented strand board where surface or edge of panel will be exposed to weather.
- C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- D. Factory mark panels to indicate compliance with applicable standard.

**2.02 PRESERVATIVE-TREATED PLYWOOD**

- A. Preservative Treatment by Pressure Process: AWPA C9.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat all plywood, unless otherwise indicated.

### **2.03 FIRE-RETARDANT-TREATED PLYWOOD**

- A. General: Comply with performance requirements in AWWA C27.
  1. Use treatment that does not promote corrosion of metal fasteners.
  2. Use Exterior type for exterior locations and where indicated.
  3. Use Interior Type A, High Temperature (HT) for roof sheathing and where indicated.
  4. Use Interior Type A, unless otherwise indicated.
- B. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Application: Treat all plywood, unless otherwise indicated.
  1. Roof and wall sheathing within 48 inches of walls.
  2. Roof sheathing.
  3. Subflooring and underlayment for raised platforms.
  4. Insert category of plywood items required to be treated.

### **2.04 WALL SHEATHING**

- A. Plywood Wall Sheathing: Exposure 1 sheathing. Use exterior grade where exposed to weather.
  1. Span Rating: Not less than 32/16.
  2. Nominal Thickness: Not less than 15/32 inch.
- B. Oriented-Strand-Board Wall Sheathing: Exposure 1 sheathing. Do not used where exposed to weather.
  1. Span Rating: Not less than 32/16.
  2. Nominal Thickness: Not less than 15/32 inch.
  3. Thickness: 3/4 inch.
- C. Foil-Faced, Polyisocyanurate-Foam Wall Sheathing: ASTM C 1289, Type I, Class 2, aluminum-foil-faced, glass-fiber-reinforced, rigid, cellular, polyisocyanurate thermal insulation. Foam-plastic core and facings shall have a flame-spread index of 25 or less when tested individually.

### **2.05 ROOF SHEATHING**

- A. Plywood Roof Sheathing: Exposure 1 sheathing. Use exterior grade where exposed to weather.
  1. Span Rating: Not less than 32/16.
  2. Nominal Thickness: As indicated on Drawings, not less than 19/32 inch.
- B. Oriented-Strand-Board Roof Sheathing: Exposure 1 sheathing. Do not use where exposed to weather.
  1. Span Rating: Not less than 32/16.
  2. Nominal Thickness: As indicated on Drawings, not less than 19/32 inch.

### **2.06 SUBFLOORING AND UNDERLAYMENT**

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, 32/16 Exposure 1, Underlayment single-floor panels.
  1. Span Rating: Not less than 24 o.c.
  2. Nominal Thickness: Not less than 23/32 inch.

3. Edge Detail: Tongue and groove.
- B. Oriented-Strand-Board Combination Subfloor-Underlayment: Exposure 1 single-floor panels.
  1. Span Rating: Not less than 24 o.c.
  2. Nominal Thickness: Not less than 23/32 inch.
  3. Edge Detail: Tongue and groove.
- C. Plywood Subflooring: Exposure 1 single-floor panels or sheathing.
  1. Span Rating: Not less than 24 o.c. or 48/24.
  2. Nominal Thickness: Not less than 23/32 inch.
- D. Oriented-Strand-Board Subflooring: Exposure 1 single-floor panels or sheathing.
  1. Span Rating: Not less than 24 o.c. or 48/24.
  2. Nominal Thickness: Not less than 23/32 inch.
- E. Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch over smooth subfloors and not less than 3/8 inch over board or uneven subfloors.
- F. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exposure 1 Underlayment with fully sanded face.
- G. Plywood Underlayment for Ceramic Tile: DOC PS 1, Exterior, C-C Plugged, not less than 5/8-inch nominal thickness, for ceramic tile set in organic adhesive.
- H. Plywood Underlayment for Carpet: DOC PS 1, Exposure 1, Underlayment.
- I. Particleboard Underlayment: ANSI A208.1, Grade M-2, Exterior Glue, complying with dimensional tolerances and thickness swell requirements of Grade PBU.
- J. Hardboard Underlayment: AHA A135.4, Class 4 (Service), Surface S1S; with back side sanded.

## **2.07 FASTENERS**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. See Division 6 Section "Rough Carpentry" for additional fastener requirements.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION, GENERAL**

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  1. NES NER-272 for power-driven fasteners.
  2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. Use box wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

### **3.02 WOOD STRUCTURAL PANEL INSTALLATION**

- A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Combination Subfloor-Underlayment:
    - a. Glue and nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.
  - 2. Subflooring:
    - a. Glue and nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.
  - 3. Wall and Roof Sheathing:
    - a. Refer to drawings for fastener size and spacing requirements.
    - b. Nail or staple to wood framing.
    - c. Screw to cold-formed metal framing.
    - d. Space panels 1/8 inch apart at edges and ends.
  - 4. Underlayment:
    - a. Nail or staple to subflooring.
    - b. Space panels 1/32 inch apart at edges and ends.
    - c. Fill and sand edge joints of underlayment receiving resilient flooring right before installing flooring.

### **3.03 PARTICLEBOARD UNDERLAYMENT INSTALLATION**

- A. Comply with the National Particleboard Association's recommendations for type of subfloor indicated. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.
  - 1. Fastening Method: Glue and nail underlayment to subflooring.

### **3.04 HARDBOARD UNDERLAYMENT INSTALLATION**

- A. Comply with AHA's "Application Instructions for Basic Hardboard Products" and with hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.
  - 1. Fastening Method: Nail underlayment to subflooring.

### **3.05 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION**

- A. General: Cover sheathing with weather-resistant sheathing paper as follows:
  - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
  - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.
- B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.
- C. Building Wrap: Comply with manufacturer's written instructions.
  - 1. Seal seams, edges, fasteners, and penetrations with tape.
  - 2. Extend into jambs of openings and seal corners with tape.

### **3.06 FIELD QUALITY CONTROL**

- A. Refer to Division 06 Section "Rough Carpentry" for inspection requirements of Structural Sheathing.

## **END SECTION**



**061753**  
**SHOP-FABRICATED WOOD TRUSSES**

**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. Wood roof trusses.
  - 2. Wood floor trusses.
  - 3. Wood girder trusses.

**1.03 ALLOWANCES**

- A. Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

**1.04 DEFINITIONS**

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

**1.05 ACTION SUBMITTALS**

- A. Product Data: For wood-preservative-treated lumber, metal-plate connectors, metal truss accessories, and fasteners.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification from treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification from treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
  - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.
- B. Sustainable Design Submittals:
  - 1. Environmental Product Declaration: For each product.
  - 2. Health Product Declaration: For each product.
  - 3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
  - 4. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
  - 5. Chain-of-Custody Qualification Data: For manufacturer and vendor.
- C. Shop Drawings: Show fabrication and installation details for trusses.
  - 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
  - 2. Indicate sizes, stress grades, and species of lumber.
  - 3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
  - 4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
  - 5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
  - 6. Show splice details and bearing details.

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

#### **1.06 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For metal connector-plate manufacturer.
- B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.
- C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.
- D. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated lumber.
  - 2. Fire-retardant-treated wood.
  - 3. Metal-plate connectors.
  - 4. Metal truss accessories.

#### **1.07 QUALITY ASSURANCE**

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
  - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- D. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- E. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
  - 1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
  - 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
  - 3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

### **PART 2 PRODUCTS**

#### **2.01 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated.
2. Maximum Deflection under Design Loads:
  - a. Roof Trusses: Vertical deflection of 1/240 of span.
  - b. Floor Trusses: Vertical deflection of 1/480 of span.
- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."
- E. Regional Materials: Wood products shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
- F. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.

## **2.02 DIMENSION LUMBER**

- A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
  3. Provide dressed lumber, S4S.
  4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal for top chords.
- C. Minimum Specific Gravity for Top Chords: 0.50.
- D. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry".

## **2.03 WOOD-PRESERVATIVE-TREATED LUMBER**

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
  1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  2. For exposed trusses indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
  1. For exposed trusses indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat all trusses unless otherwise indicated.

## **2.04 FIRE-RETARDANT-TREATED WOOD**

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products according to test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, with no evidence of significant progressive

combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
  2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
  3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use for interior locations where exterior type is not indicated.
  4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
1. For exposed trusses and bracing indicated to receive a stained or natural finish, mark end or back of each piece.
- E. For exposed trusses indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on Drawings, and the following:
1. Floor trusses.
  2. Roof trusses.

## 2.05 METAL CONNECTOR PLATES

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
1. Alpine Engineered Products, Inc.; a division of ITW Building Components Group, Inc.
  2. Cherokee Metal Products, Inc.; Masengill Machinery Company; Masengill Machinery Company.
  3. CompuTrus, Inc.
  4. Eagle Metal Products.
  5. Jager Building Systems, Inc.
  6. MiTek Industries, Inc.
  7. Robbins Engineering, Inc.
  8. Truswal Systems Corporation.
- B. Fabricate connector plates to comply with TPI 1.
- C. Hot-Dip Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.
1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
1. Use for wood-preservative-treated lumber and where indicated.
- E. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304 and not less than 0.035 inch thick.
1. Use for exterior locations, wood-preservative-treated lumber and where indicated.

## 2.06 FASTENERS

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

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

## **2.07 METAL FRAMING ANCHORS AND ACCESSORIES**

- A. Allowable design loads, as published by manufacturer, shall comply with or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.
  1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
  1. Use for wood-preservative-treated lumber and where indicated.
- D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
  1. Use for exterior locations and where indicated.
- E. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick.
- F. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of truss and fastens to both sides of truss, top plates, and one side of stud below.
- G. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/2 inches wide by 0.062 inch thick. Tie fits over top of truss and fastens to both sides of truss, inside face of top plates, and both sides of stud below.
- H. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches wide by 0.050 inch thick. Clip is fastened to truss through slotted holes to allow for truss deflection.
- I. Floor Truss Hangers: U-shaped hangers, full depth of floor truss, with 1-3/4-inch- long seat; formed from metal strap 0.062 inch thick with tabs bent to extend over and be fastened to supporting member.
- J. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches wide by 1 inch deep by 0.040 inch thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.
- K. Drag Strut Connectors: Angle clip with one leg extended for fastening to the side of girder truss.
  1. Angle clip is 3 by 3 by 0.179 by 8 inches with extended leg 8 inches long. Connector has galvanized finish.
  2. Angle clip is 3 by 3 by 0.239 by 10-1/2 inches with extended leg 10-1/2 inches long. Connector has painted finish.

## **2.08 MISCELLANEOUS MATERIALS**

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 92 percent zinc dust by weight.

## **2.09 FABRICATION**

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

- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
  - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## **2.10 SOURCE QUALITY CONTROL**

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.
  - 1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
  - 2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.
- B. Correct deficiencies in Work that special inspections indicate do not comply with the Contract Documents.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
  - 1. Anchor trusses to girder trusses as indicated.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
  - 1. Install bracing to comply with Section 061000 "Rough Carpentry".
  - 2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- L. Replace wood trusses that are damaged or do not comply with requirements.
  - 1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

### **3.02 REPAIRS AND PROTECTION**

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- C. Repair damaged galvanized coatings on exposed surfaces according to ASTM A780/A780M and manufacturer's written instructions.

### **3.03 FIELD QUALITY CONTROL**

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections to verify that temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

**END SECTION**

**SECTION 062013**  
**EXTERIOR FINISH CARPENTRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Exterior finish carpentry items, including:
  - 1. Wood soffits.

**1.02 RELATED REQUIREMENTS**

- A. Section 099300 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

**1.03 REFERENCE STANDARDS**

- A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- C. PS 20 - American Softwood Lumber Standard.
- D. WRCLA (GR) - Western Red Cedar Lumber Association Grading Rules.

**1.04 SUBMITTALS**

- A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
- B. Samples: Submit two samples of each type of wood soffit boards, 12 inch long, illustrating profiles and completed finishes.

**1.05 QUALITY ASSURANCE**

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this Section with minimum five years of documented experience.
  - 1. Single Source Responsibility: Provide and install this work from single fabricator.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
  - 1. Store finish carpentry items in installation areas. If finish carpentry items must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.
  - 2. Stack lumber and provide for adequate air circulation within and around stacks and under temporary coverings.
  - 3. Protect from moisture damage.
- B. Handle materials and products to prevent damage to edges, ends, or surfaces.

**1.07 ENVIRONMENTAL CONDITIONS**

- A. Comply with specified standard and as additionally specified.
- B. Do not deliver finish carpentry items until environmental conditions meet specified requirements for installation areas.
- C. Do not deliver or install finish carpentry items until building is enclosed and weatherproof, wet work in installation areas is complete and nominally dry, and building's environmental control systems are operating and will maintain temperature and relative humidity at designed occupancy levels throughout the remainder of the construction period.



## **PART 2 PRODUCTS**

### **2.01 FINISH CARPENTRY ITEMS**

- A. Quality Standard - General: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless otherwise specified for each carpentry item.
  - 1. Cedar Soffits: WRCLA (GR), Custom Clear grade.
- B. Exterior Woodwork Items:
  - 1. Soffits: Softwood lumber; prepare for stain and transparent finish.

### **2.02 LUMBER MATERIALS**

- A. Softwood Lumber: PS 20; Western red cedar species, plain sawn; maximum moisture content of 6 percent according to ASTM D4442; with flat grain, of quality suitable for transparent finish.

### **2.03 FASTENINGS**

- A. Fasteners: Of size and type to suit application; galvanized finish.
- B. Concealed Joint Fasteners: Threaded steel.

### **2.04 ACCESSORIES**

- A. Lumber for Shimming and Blocking: Softwood lumber of fir or pine species.
- B. Primer: Alkyd primer sealer.
- C. Wood Filler: Latex base, tinted to match surface finish color.

### **2.05 SITE FINISHING MATERIALS**

- A. Field Finishing: See Section 09 9300.

### **2.06 FABRICATION**

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify adequacy of backing and support framing.
- B. Verify electrical and building items affecting work of this Section are placed and ready to receive this work.

### **3.02 INSTALLATION**

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- D. Install components with finish nails at maximum 8 inch on center.
- E. Install finish carpentry items with minimum number of joints practical, using full length pieces from maximum lengths of lumber available. Do not use individual pieces less than 24 inches long, except where necessary.
  - 1. Cope at returns and miter at corners to produce tight-fitting joints with full surface contact throughout the length of joints.
  - 2. Plane back surfaces of casings as required to provide uniform thickness and flush finished surfaces across joints.

### **3.03 PREPARATION FOR SITE FINISHING**

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 099300.

**3.04 TOLERANCES**

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

**3.05 PROTECTION**

- A. Protect installed finish carpentry items from damage due to subsequent construction operations.

**END OF SECTION**

**SECTION 064100**  
**ARCHITECTURAL WOOD CASEWORK**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Architectural wood casework, including:
  - 1. Specially fabricated cabinet and casework units.
  - 2. Hardware.
  - 3. Factory finishing.
- B. Preparation for installing utilities.

**1.02 RELATED REQUIREMENTS**

- A. Section 123600 - Countertops.

**1.03 REFERENCE STANDARDS**

- A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- D. BHMA A156.9 - American National Standard for Cabinet Hardware.
- E. NEMA LD 3 - High-Pressure Decorative Laminates.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Before fabrication of casework required to be fitted to other construction, obtain measurements and verify dimensions and shop drawing details as required for accurate fit.
  - 2. Verify accurate field measurements in installation areas before wall cavities are enclosed; verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork; record measurements on shop drawings.
  - 3. Coordinate construction to ensure that actual dimensions correspond to established required dimensions.
  - 4. Coordinate cabinet spacing and clearances to ensure that doors and drawers do not conflict with each other.
  - 5. Coordinate cabinet opening and spacing requirements with approved appliances and plumbing fixtures.
  - 6. Additional compensation will not be allowed for replacement or modification of casework resulting from failure to verify field dimensions.

**1.05 SUBMITTALS**

- A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
  - 2. Provide information as required by AWI/AWMAC/WI (AWS).
  - 3. Shop drawings are required to be generated as separate digital drawings specific to this Project, not utilizing Architect's digital drawing files in any manner.
  - 4. Show all adjacent construction including abutting walls, columns and similar elements affecting casework installation.
- B. Product Data: Provide data for hardware accessories.
- C. Samples: Submit actual samples of all specified casework finishes, 12 inches square, illustrating specified substrates and finishes.
  - 1. Provide not less than two of each type of exposed product and finish as specified in this Section.
  - 2. Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

### 1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this Section with minimum five years of documented experience.
  - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

### 1.07 MOCK-UPS

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
  - 1. Locate where directed.
  - 2. Mock-up may remain as part of the work.

### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver casework items to installation areas only after clean, well ventilated, and temperature-controlled installation areas are available. Do not deliver casework items to installation areas until painting and similar operations are complete in those areas.
- B. Protect units from moisture and impact damage during transit, delivery, and storage; use protective covers during delivery, storage, and handling operations.

### 1.09 FIELD CONDITIONS

- A. Do not deliver or install casework items until building is enclosed and weatherproof, and building's environmental control systems are operating and will maintain temperature and relative humidity at designed occupancy levels throughout the remainder of the construction period.
- B. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

## PART 2 PRODUCTS

### 2.01 WOOD CASEWORK AND CABINETS

- A. Quality Standard - General: Grades as indicated or specified, in accordance with AWI/AWMAC/WI (AWS).
  - 1. Plastic Laminate Faced Cabinets:
    - a. Quality Standard: Custom Grade, unless noted otherwise.
    - b. Structural Performance Duty Level: 3 (Institutional).

### 2.02 PANEL CORE MATERIALS

- A. Medium Density Fiberboard (MDF): ANSI A208.2; Grade 130; pressed hardwood or softwood fibers, made with fire-retardant and waterproof resin binders, tempered grade; sanded faces.
  - 1. Fire-retardant additive blended with wood fibers during manufacturing process; product inherently capable of providing Class 1 flame spread index and smoke developed index when tested in accordance with ASTM E84.
  - 2. Core: Dyed red to identify product.
  - 3. Acceptable Product:
    - a. Roseburg Forest Products Company; Medite FR: [www.roseburg.com](http://www.roseburg.com).

### 2.03 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
  - 1. Acceptable Manufacturers:
    - a. As specified on Drawings.
- B. Colors and Patterns: As selected by Architect.

### 2.04 COUNTERTOPS

- A. Countertops: See Section 123600.

### 2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.

- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.

## 2.06 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified, unless otherwise specified in this Section.
  - 1. Finish: Stainless steel; No. 4 (matte) finish.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.
- C. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.
- D. Cabinet Locks: Keyed cabinet-grade lock, two keys per lock, steel with satin finish.
- E. Drawer Slides:
  - 1. Type: Full extension with overtravel.
  - 2. Static Load Capacity: Commercial grade.
  - 3. Mounting: Side mounted.
  - 4. Stops: Integral type.
  - 5. Features: Provide self-closing/stay-closed/soft-close type.
  - 6. Acceptable Manufacturers:
    - a. Accuride International, Inc.: [www accuride.com/#sle](http://www accuride.com/#sle).
    - b. Blum, Inc.: [www blum.com/#sle](http://www blum.com/#sle).
    - c. Grass America Inc.: [www grassusa.com/#sle](http://www grassusa.com/#sle).
    - d. Hettich America, LP: [www hettich.com/sle](http://www hettich.com/sle).
    - e. Knappe & Vogt Manufacturing Company: [www knapeandvogt.com/#sle](http://www knapeandvogt.com/#sle).
- F. Hinges: European style concealed, self-closing type, steel with satin finish.
  - 1. Features: Provide self-closing/stay-closed/soft-close type with 3-way independent adjustment.
  - 2. Provide minimum three hinges on doors exceeding 24 inches wide by 36 inches high.
  - 3. Acceptable Manufacturers:
    - a. Blum, Inc.: [www blum.com/#sle](http://www blum.com/#sle).
    - b. Grass America Inc.: [www grassusa.com/#sle](http://www grassusa.com/#sle).
    - c. Hardware Resources: [www hardwareresources.com/#sle](http://www hardwareresources.com/#sle).
    - d. Hettich America, LP: [www hettich.com/sle](http://www hettich.com/sle).
- G. Door Bumpers: Drilled-in, clear, soft plastic.

## 2.07 FABRICATION

- A. Cabinet Style: Flush overlay.
- B. Minimum Component Thicknesses:
  - 1. Tops: As specified in Section 123600.
  - 2. End and Back Panels: 3/4 inch, recessed or flush; provide end and back panels on all cabinets.
  - 3. Box Drawers: 3/4 inch solid hardwood sides, dovetailed and glued; 1/4 inch thick 5-ply plywood bottoms, fitted into dado, glued and blocked into place; equipped with drawer glides with stops to prevent accidental removal.
  - 4. File Drawers: Same as box drawers, except 3/4 inch thick 5-ply plywood bottoms.
- C. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- D. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- E. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

- F. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum 2 feet from sink cut-outs.
  - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
  - 2. Apply thermally fused laminate to inside of cabinets on exposed and semi-exposed surfaces, and to shelving surfaces.
- G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Inspection at Delivery: Inspect woodwork for scratches, marks, or other damage. Work which cannot be satisfactorily repaired will be rejected.
- B. Verification of Conditions: Examine areas and conditions under which the work of this Section will be performed. Do not proceed until unsatisfactory conditions have been corrected. Commencement of work constitutes acceptance of all installation areas and conditions.
  - 1. Verify adequacy of backing and support framing.
  - 2. Verify location and sizes of utility rough-in associated with work of this Section.
  - 3. Verify critical clearances and dimensions prior to installation of casework items.

#### **3.02 PREPARATION**

- A. Conditioning: Condition woodwork to average prevailing humidity conditions in installation areas prior to installation.
- B. Deliver inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be constructed.
- C. Provide sufficient and substantial anchorage for supporting casework components and fillers where shown or required.

#### **3.03 INSTALLATION**

- A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated. Install woodwork without distortion so that doors and drawers will fit openings properly and be accurately aligned.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.
- G. Secure full height cabinets, shelving units, and similar casework items exceeding 60 inches in height to floor using appropriate angles and anchorages.
- H. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- I. Fit hardware accurately and install in accordance with manufacturer's instructions. Adjust hardware to center doors and drawers in openings to provide unencumbered operation. Complete installation of hardware and accessory items.

#### **3.04 ADJUSTING**

- A. Test installed work for rigidity and ability to support loads.
- B. Adjust moving or operating parts to function smoothly and correctly.
- C. Clean and lubricate hardware. Make final adjustments for proper operation.
- D. Adjust doors and drawers to operate freely, but not loosely, without sticking or binding. Adjust all hardware for proper function at time of Final Completion.

**3.05 CLEANING**

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

**3.06 PROTECTION**

- A. Protect installed casework items from damage due to subsequent construction operations.

**END OF SECTION**

**SECTION 066310**  
**PLASTIC FABRICATED BENCHES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Plastic-fabricated locker room bench seating.
- B. Attachment components and accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

**1.03 SUBMITTALS**

- A. Shop Drawings: Submit shop drawings indicating materials, component profiles, bracket spacing, fastening methods, jointing details, finishes, and accessories to a minimum scale of 1-1/2 inch to one foot.
- B. Product Data: Submit data for use of attachment hardware.
- C. Samples: Submit two samples 12 inches long of plastic carpentry profiles.
  - 1. Submit samples of available colors and textures for selection.
- D. Maintenance Materials:
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Supply two seating planks and mounting brackets for Owner's use in maintenance of project.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of experience.
- B. Basis of Design: Specifications are based on plastic fabrications by specified basis of design manufacturer and product(s). Plastic fabrications manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in composition, density, and profile are minor, and do not detract substantially from the indicated design intent.

**1.05 MOCK-UP**

- A. Mock-up: Construct field sample, minimum 8 feet long, illustrating bench construction and attachment to representative substrate.
  - 1. Locate where directed.
  - 2. Mock-up may remain as part of the Work.

**1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Store materials in ventilated, interior locations under constant minimum temperature of 60 degrees F.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. Tangent Technologies, LLC; PolyTuf Plastic Lumber: [www.tangentusa.com](http://www.tangentusa.com).
  - 2. Basis of design may include extended lead time items; substitutions based on lead time will not be accepted.

**2.02 MATERIALS**

- A. Plastic Lumber: Manufacturer's proprietary HDPE formulation, containing UV-inhibitive pigments, anti-oxidant processing aids, and foaming agents as required for indicated end-uses; wood-grain textured surfaces; continuous lengths with finished ends and edges; profiles as indicated on Drawings.
  - 1. Conform to ASTM E84 and applicable code for fire retardant requirements.
  - 2. Color: As selected by Architect from manufacturer's full line.

**2.03 ACCESSORIES**

- A. Mounting Brackets: Stainless steel; specified in Section 055000, or as indicated on Drawings.
- B. Bolts, Nuts, Washers, Lags, and Screws: Size and type to suit application; non-corrosive base metal.



## **2.04 FABRICATION**

- A. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated on Drawings.
- B. Verify that surfaces and openings are ready to receive work and field measurements are as required for proper installation.
- C. Verify mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.
- D. Beginning of installation means acceptance of conditions.

### **3.02 INSTALLATION**

- A. Install work in accordance with manufacturer's printed specifications and recommendations.
- B. Set and secure materials and components in place, plumb, and level.
- C. Install components with concealed or countersunk fasteners as appropriate to each item as indicated on Drawings.

### **3.03 TOLERANCES**

- A. Maximum Variation From True Position: 1/8 inch.
- B. Maximum Offset From True Alignment: 1/8 inch.

### **3.04 PROTECTION**

- A. Protect finished installation from damage, including edges, corners, and finished surfaces.

**END OF SECTION**

**SECTION 068316**  
**FIBERGLASS REINFORCED PLASTIC (FRP) PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fiberglass reinforced plastic panels.
- B. Accessories and trim.

**1.02 REFERENCE STANDARDS**

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- C. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ISO 846 - Plastics - Evaluation of the action of microorganisms.
- F. ISO 2812-1 - Paints and varnishes -- Determination of resistance to liquids -- Part 1: Immersion in liquids other than water.

**1.03 SUBMITTALS**

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

**1.04 QUALITY ASSURANCE**

- A. Basis of Design: Specifications are based on panel types by specified basis of design manufacturer and product(s). Panel types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, weight, and profile are minor, and do not detract substantially from the indicated design intent.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

**1.06 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.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer - Panels:
  - 1. Marlite: [www.marlite.com](http://www.marlite.com).
    - a. Panel Type A: Standard FRP.
    - b. Panel Type B: Symmetrix SmartSeam FRP.
- B. Other Acceptable Manufacturers:
  - 1. Crane Composites, Inc.: [www.cranecomposites.com](http://www.cranecomposites.com).
  - 2. Glasteel: [www.glasteel.com](http://www.glasteel.com).
  - 3. Nudo Products, Inc.: [www.nudo.com/#sle](http://www.nudo.com/#sle).
  - 4. Panolam Industries International, Inc.: [www.panolam.com/#sle](http://www.panolam.com/#sle).

**2.02 PANEL SYSTEMS**

- A. Type A Wall Panels:
  - 1. Panel Size: As indicated on Drawings.
  - 2. Panel Thickness: 0.100 inch (2.5 mm).
  - 3. Surface Design: Embossed.
  - 4. Color: As selected from manufacturer's full line.
  - 5. Attachment Method: Adhesive only, with trim and sealant in joints.

- B. Type B Wall Panels:
  - 1. Panel Size: As indicated on Drawings.
  - 2. Panel Thickness: 3/32 inch (2.3813 mm).
  - 3. Surface Design: Smooth.
  - 4. Pattern and Colors: Tile pattern as selected from manufacturer's full line; with basis of design manufacturer's sanitary sealer coating.
  - 5. Attachment Method: Adhesive only, with trim and sealant in joints.

### **2.03 MATERIALS**

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
  - 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
  - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  - 3. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.
  - 4. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
  - 5. Biological Resistance: Rating of 0, when tested in accordance with ISO 846.
- B. Trim: Vinyl; color coordinating with panel.
- C. Adhesive: Type recommended by panel manufacturer.
- D. Sealant: Silicone; color matching panel.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

#### **3.02 INSTALLATION - WALLS**

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Place trim on panel before fastening edges, as required.
- G. Fill channels in trim with sealant before attaching to panel.
- H. Install trim with adhesive and screws or nails, as required.
- I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- J. Remove excess sealant after paneling is installed and prior to curing.

**END OF SECTION**

**SECTION 070553**  
**FIRE AND SMOKE ASSEMBLY IDENTIFICATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Identification markings for fire and smoke rated partitions, and fire rated walls.

**1.02 REFERENCE STANDARDS**

- A. ICC (IBC) - International Building Code.

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
- B. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.

**1.04 FIELD CONDITIONS**

- A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.
- B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Fire Wall Signs, Inc.: [www.firewallsigns.com](http://www.firewallsigns.com).
  - 2. Safety Supply Warehouse, Inc.: [www.safetysupplywarehouse.com](http://www.safetysupplywarehouse.com).

**2.02 ASSEMBLY IDENTIFICATION - GENERAL**

- A. Provide all signs required by Authority Having Jurisdiction (AHJ) for marking and identification of fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions, and other walls required to have protected openings; determine requirements and report to Owner and Architect prior to making specified submittals.
  - 1. Include cost of these signs in Contract Sum.

**2.03 FIRE AND SMOKE ASSEMBLY IDENTIFICATION**

- A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).
- B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl sign with factory applied adhesive backing.
- C. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil.
- D. Languages: Provide sign markings in English and Spanish.

**2.04 WALL, BARRIER, AND PARTITION SIGNS**

- A. Sign Type: Flat signs with applied character media; permanent materials and installation.
  - 1. Sign Copy: Lettering not less than 3.0 inch high; copy content as specified in this Section or required otherwise by applicable Code.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.

**3.02 INSTALLATION - GENERAL**

- A. Locate markings as required by ICC (IBC), and as follows:
  - 1. Sign Copy: "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS."
  - 2. Spacing: Maximum 30 feet on center, measured along wall or partition; minimum one sign on each wall plane or surface.

- B. Install adhered markings in accordance with manufacturer's instructions.
- C. Install applied markings in general accordance with Section 099123.
- D. Install neatly, with horizontal edges level.
- E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

### **3.03 THROUGH-PENETRATION FIRESTOPPING IDENTIFICATION**

- A. Identify firestopping systems with pre-printed metal or plastic labels. Attach label permanently to surfaces immediately adjacent to and within 6 inches of edge of firestop installation so that label will be visible to anyone seeking to remove penetrating items or firestop system.
  - 1. Metal Labels: Use mechanical fasteners.
  - 2. Plastic Labels: Use self-adhering type with adhesive capable of permanently bonding label to substrate and, in combination with label material, will result in partial destruction of label if removal is attempted.
- B. Include following information on each label:
  - 1. The words "WARNING - THROUGH-PENETRATION FIRESTOP SYSTEM - DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE."
  - 2. Installing contractor's name, address, and phone number.
  - 3. Firestop system designation, including applicable testing and inspection agency.
  - 4. Date of installation.
  - 5. Firestop system manufacturer's name.
  - 6. Installer's name.

**END OF SECTION**

**SECTION 071113**  
**BITUMINOUS DAMPPROOFING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Bituminous dampproofing.
- B. Protection boards.

**1.02 REFERENCE STANDARDS**

- A. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.

**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 documented experience.

**1.05 FIELD CONDITIONS**

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

**PART 2 PRODUCTS**

**2.01 BITUMINOUS DAMPPROOFING**

- A. Bituminous Dampproofing: Cold-applied, spray-grade; asphalt base, volatile petroleum solvents, and other content, suitable for application by spray, brush, roller, or squeegee; asbestos-free; suitable for application on vertical and horizontal surfaces.
  - 1. Composition: ASTM D4479/D4479M Type I, asbestos free.
  - 2. VOC Content: Not more than permitted by local, State, and federal regulations.
  - 3. Applied Thickness: 1/16 inch, minimum, wet film.
  - 4. Acceptable Product:
    - a. W. R. Meadows, Inc.; Sealmatic Spray-Mastic: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
- B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

**2.02 ACCESSORIES**

- A. Insulation Cover Board: Rigid insulation specified in Section 072100.
- B. Protection Board: 1/8-inch 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 dampproofing.

- B. Perform this work in accordance with manufacturer's instructions.
- C. Apply from 2 inches below finish grade elevation down to top of footings or bottom of grade beams as applicable, unless otherwise indicated on Drawings.
- D. Seal items watertight with mastic, that project through dampproofing surface.
- E. Place insulation cover board and protection board directly over dampproofing; butt joints, and adhere to tacky dampproofing.
- F. Scribe and cut boards around projections, penetrations, and interruptions.

**END OF SECTION**

**SECTION 072100**  
**THERMAL INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Thermal foam board insulation:
  - 1. Perimeter of foundation.
  - 2. Insulation over exterior concrete masonry walls - continuous insulation.
  - 3. Insulation over roof deck under metal roof panels.

**1.02 REFERENCE STANDARDS**

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

**1.03 SUBMITTALS**

- A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- B. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Do not allow insulation materials to become wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage, and protection during installation.
- B. Protect plastic insulation from exposure to direct sunlight.
- C. Do not deliver plastic insulation materials to the project site ahead of time of installation. Protect at all times against ignition. Complete the installation and concealment of plastic materials as soon as possible in each area of work.

**1.05 FIELD CONDITIONS**

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. As specified in this Section for each insulation type and application.

**2.02 APPLICATIONS**

- A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- B. Insulation Over Exterior Concrete Masonry Walls - Continuous: Polyisocyanurate board.
- C. Insulation Over Roof Deck Under Metal Roof Panels: Polyisocyanurate nail base board.

**2.03 FOAM BOARD INSULATION MATERIALS**

- A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
  - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
  - 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. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
  - 5. Board Thickness: As indicated on Drawings.
  - 6. Board Edges: Square.
  - 7. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.



8. Acceptable Product:
  - a. Owens Corning Corporation; FOAMULAR NGX Type IV Next Generation Extruded: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
- B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.
  1. Classification: Type II; faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
    - a. Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of core foam.
    - b. Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
    - c. Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48), minimum, at 75 degrees F.
  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. Board Size: 48 inch by 96 inch.
  5. Board Thickness: 1.0 inch.
  6. Board Edges: Square.
  7. Acceptable Products:
    - a. Carlisle Coatings & Waterproofing, Inc.; R2+ Sheathe: [www.carlisleccw.com/#sle](http://www.carlisleccw.com/#sle).
    - b. DuPont de Nemours, Inc.; THERMAX (ci): [www.building.dupont.com/#sle](http://www.building.dupont.com/#sle).
    - c. Johns Manville; CI Max: [www.jm.com/#sle](http://www.jm.com/#sle).
- C. Rigid Cellular Polyisocyanurate (ISO) Thermal Insulation Board Faced with Plywood (Nail Base): Complying with ASTM C1289.
  1. Classification: Type V; faced with plywood on one major surface of the core foam and faced on the other major surface with any facer described in this specification.
    - a. Compressive Strength: 16 psi, minimum.
    - b. Thermal Resistance, R-value: At 1-1/2 inch thick; 6.2, minimum, at 75 degrees F.
  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. Board Size: 48 inch by 96 inch.
  5. Plywood Thickness: 5/8 inch.
  6. Insulation Board Thickness: As indicated on Drawings.
  7. Board Edges: Square.
  8. Acceptable Products:
    - a. Atlas Roofing Corporation; ACFoam Nail Base Nailable Roof Insulation: [www.atlasroofing.com/#sle](http://www.atlasroofing.com/#sle).
    - b. Hunter Panels; Xci Ply: [www.hunterpanels.com/#sle](http://www.hunterpanels.com/#sle).
    - c. Rmax Inc; ECOMAXci FR Ply: [www.rmax.com/#sle](http://www.rmax.com/#sle).

## 2.04 ACCESSORIES

- A. Tape: Type and composition matching each type of membrane or insulation to be taped; self-adhering, mesh reinforced, 2 inch wide.
- B. Foam Board Insulation Fasteners: Insulation manufacturer's recommended polymer or other corrosion-resistant coated steel screws, with compatible 2 inch diameter plastic washers, designed for anchoring sheathing to indicated backing materials; fastener length as required for thickness of insulation material and penetration of substrates as indicated.
- C. Protection Board for Below Grade Insulation: Fiberglass reinforced plastic panels, 0.060 inch thick.
  1. Color: Gray.
  2. Acceptable Product:
    - a. Nudo Products, Inc.; GroundBreaker: [www.nudo.com/#sle](http://www.nudo.com/#sle).
- D. Adhesive: Type recommended by insulation manufacturer for indicated applications.
- E. Penetration and Gap Filler: Foamed-in-place insulation; type as specified in Section 072119.

## **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 honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

### **3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER**

- A. Apply specified adhesive to back of boards.
  - 1. Three continuous beads per board length.
- B. Install boards horizontally on foundation perimeter.
  - 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.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- D. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
  - 1. Apply specified adhesive in five continuous beads per board length.
  - 2. Install boards horizontally from base of foundation to top of insulation.
  - 3. Butt boards tightly, with joints staggered from insulation joints.

### **3.03 BOARD INSTALLATION AT EXTERIOR WALLS**

- A. Install rigid insulation directly to concrete masonry walls and over indicated air barrier system with specified fasteners at maximum 16 inches on center with manufacturer's recommended mechanical fasteners.
  - 1. Tape joints in insulation using manufacturer's required flashing tape product, in accordance with insulation manufacturer's instructions for joint types indicated or required.
  - 2. Seal joints in insulation with specified penetration and gap filler in accordance with manufacturer's instructions for joint types indicated or required.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### **3.04 BOARD INSTALLATION OVER ROOF DECK UNDER METAL ROOF PANELS**

- A. Board Installation Over Roof Deck - General:
  - 1. Ensure deck surfaces are clean and dry, continuous, and ready for application of insulation system.
  - 2. Do not apply more insulation than can be covered with roofing in same day.
- B. Attachment of Insulation: Mechanically fasten insulation to deck in accordance with insulation manufacturer's instructions.
  - 1. Use minimum 2 fasteners per board, regardless of board size.
  - 2. Use minimum one fastener per 4 sq ft.

### **3.05 PROTECTION**

- A. Do not permit installed insulation to be damaged prior to its concealment.

**END OF SECTION**

**SECTION 072700**  
**AIR BARRIERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air barriers.
- B. Air barrier system accessories, including:
  - 1. Sealants, tapes, and accessories for sealing air barrier and adjacent substrates.
  - 2. Other specified system accessories.

**1.02 DEFINITIONS**

- A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but may be water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

**1.03 REFERENCE STANDARDS**

- A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- C. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- D. ASTM E1677 - Standard Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the installation of weather barriers with adjacent flashings and weather barriers for compatibility and continuity of those systems.
  - 2. Coordinate installation of flexible flashing at openings with Sections that specify window, door, and other opening installations.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this Section; require attendance by all affected installers.
  - 1. Discuss installation procedures, requirements for items that penetrate the system, and other pertinent issues.

**1.05 SUBMITTALS**

- A. Product Data: Provide data on material characteristics, performance criteria, and limitations.
- B. Shop Drawings: Provide drawings of special joint conditions, including special flashing conditions where incompatible materials are in close proximity to or in contact with specified air barriers.
- C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

**1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years documented experience.
- B. System Compatibility: Assume responsibility for confirming that weather barrier system components are compatible with each other as a system, and also compatible with substrate surfaces with which they will be in contact, including but not limited to wall and sheathing surfaces, opening materials, other flashings and weather barrier materials, and joint sealants.
  - 1. Assure that system components are compatible as specified prior to preparing and making specified submittals.
  - 2. Assume responsibility for removal of incompatible system components and installation of properly compatible components at no additional cost to Owner regardless of when incompatibility is discovered.

- C. Basis of Design: Specifications are based on primary air barrier systems by specified basis of design manufacturer. Primary air barrier systems manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design and performance are minor, and do not detract substantially from the indicated design intent.

### 1.07 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

## PART 2 PRODUCTS

### 2.01 AIR BARRIER ASSEMBLIES

- A. Air Barriers:
  - 1. On outside of exterior sheathing use air barrier coating.

### 2.02 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. Air Barrier Coating:
  - 1. Dry Film Thickness (DFT): 20 mil, 0.020 inch, minimum.
  - 2. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
  - 3. Water Vapor Permeance: 11 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F.
  - 4. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 90 days of weather exposure.
  - 5. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
  - 6. VOC Content: Zero.
  - 7. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
  - 8. Basis of Design Product:
    - a. DuPont de Nemours, Inc.; Tyvek Fluid Applied WB+ with Tyvek Fluid Applied Flashing and Joint Compound, Sealant for Tyvek Fluid Applied System, and StraightFlash: [building.dupont.com/#sle](http://building.dupont.com/#sle).

### 2.03 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
- B. Silicone Sealant: ASTM C920, Grade NS, Class 25; single component, neutral curing, non-sagging, non-staining, fungus resistant, non-bleeding.
  - 1. Color: White.
  - 2. Movement Capability: Plus and minus 25 percent, minimum.
  - 3. Service Temperature Range: -65 to 180 degrees F.
  - 4. Shore A Hardness Range: 15 to 35.
  - 5. Applications:
    - a. Perimeter air seals not exposed to weather or sunlight between weather barriers and frames of windows, aluminum curtainwall framing, and similar applications.
  - 6. Acceptable Product:
    - a. Dow Chemical Company; DOWSIL 758: [consumer.dow.com/en-us/industry/ind-building-construction.html/#sle](http://consumer.dow.com/en-us/industry/ind-building-construction.html/#sle)
- C. Accessory Components: As recommended by primary weather barrier membrane manufacturer.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready for work of this Section.
- B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.
- C. Do not proceed with this work until unsatisfactory conditions have been corrected.

### 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 installation instructions.

### 3.03 INSTALLATION

- A. Install materials in accordance with basis of design manufacturer's instructions and ASTM E1677, and as otherwise specified in this Section.
  - 1. Also comply with applicable requirements of ASTM E2112 for installation of air barrier materials in conjunction with installation of windows, aluminum storefronts, doors, louvers, and similar opening elements.
- B. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- C. Fluid-Applied Coatings or Membranes:
  - 1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
  - 2. Cold Weather Applications: Comply with manufacturer's protocols and special application instructions.
  - 3. Where exterior masonry veneer is being installed, install masonry anchors before installing air barrier over masonry; provide airtight seal around anchors.
  - 4. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.
  - 5. Provide flexible flashing or extra thickness of reinforced coating at all changes in plane, intersections with other weather barriers, flashings, and other components of the weather barrier enclosure.
- D. Openings and Penetrations in Exterior Air Barriers:
  - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
  - 2. At openings 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 wide; do not seal sill flange.
  - 3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
  - 4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air 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 air barrier surface.

### 3.04 FIELD QUALITY CONTROL

- A. Do not cover installed air barriers until required inspections have been completed.
- B. Obtain approval of installation procedures from air barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- C. Take digital photographs of each portion of installation prior to covering up air barriers.

### 3.05 PROTECTION

- A. Protect installed air barrier systems and associated flashings from damage until covered by subsequent construction.
- B. Do not leave materials exposed to weather longer than recommended by manufacturer.

**END OF SECTION**

**SECTION 074113**  
**METAL ROOF PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Manufactured metal roof panel systems, including:
  - 1. Metal roof panels.
  - 2. Underlayments and system accessories.
  - 3. Related sheet metal flashings, closures, and trim.
- B. Design of roof panel system attachment to building structure to comply with specified requirements.

**1.02 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- D. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- F. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
- G. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
- H. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: 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.

**1.04 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Physical characteristics of components.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation instructions and recommendations.
- B. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
  - 1. Indicate panel numbering system.
  - 2. Differentiate between shop and field fabrication.
  - 3. Indicate substrates and adjacent work with which the wall system must be coordinated.
  - 4. Include large-scale details of anchorages and connecting elements.
  - 5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
  - 6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- C. Samples: Submit two samples of roof panel, 12 inches by 12 inches in size, illustrating finish color, sheen, and texture.
- D. Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

**1.05 QUALITY ASSURANCE**

- A. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of Work and licensed in California.

- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Basis of Design: Specifications are based on roof panel types by specified basis of design manufacturer. Roof panel types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, weight, and profile are minor, and do not detract substantially from the indicated design intent.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.
- B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.
  - 1. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

#### **1.07 FIELD CONDITIONS**

- A. Do not install metal roof panels, eave protection membrane or underlayment when surface, ambient air, or wind chill temperatures are below 45 degrees F.

#### **1.08 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 40-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
- C. Special Warranty: Provide 20-year No Dollar Limit (NDL) warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. Berridge Manufacturing Company; Double-Lock Zee-Lock Panel: [www.berridge.com/#sle](http://www.berridge.com/#sle).
- B. Other Acceptable Manufacturers:
  - 1. ATAS International, Inc.: [www.atas.com/#sle](http://www.atas.com/#sle).
  - 2. Centria, a Nucor Company: [www.centria.com/#sle](http://www.centria.com/#sle).
  - 3. MBCI, a Cornerstone Building Brands Company: [www.mbc.com/#sle](http://www.mbc.com/#sle).
  - 4. Taylor Metal Products: [www.taylormetal.com/#sle](http://www.taylormetal.com/#sle).

#### **2.02 PERFORMANCE REQUIREMENTS**

- A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
  - 1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
    - a. Uplift Pressure Resistance Requirements: As specified on structural Drawings for field, perimeter, and corner areas.
    - b. Dead Loads: Weight of roofing system.
    - c. Live Loads: As required by ASCE 7 and other criteria specified on structural Drawings.
  - 2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
  - 3. Water Penetration: No water penetration when tested in accordance with procedures and recommended test pressures of ASTM E1646.
  - 4. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

## 2.03 METAL ROOF PANELS

- A. Metal Roof Panels: 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.
  - 1. Provide engineered systems tested in accordance with UL 580 or ASTM E1592, and as otherwise required by applicable building code.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
  - 1. Material: Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.
  - 2. Profile: Standing seam, with minimum 2.0 inch seam height; concealed fastener system lapped seam in standing seam profile.
  - 3. Texture: Smooth.
  - 4. Length: Maximum possible length to minimize lapped joints. Where lapped joints are unavoidable, space laps so that each sheet spans over three or more supports.
  - 5. Width: Maximum panel coverage of 16 inches, unless otherwise indicated on Drawings.
  - 6. Color: As selected by Architect from manufacturer's full line.

## 2.04 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

## 2.05 FABRICATION

- A. Panels: Provide factory fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

## 2.06 FINISHES

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch.
  - 1. Apply coating to exposed metal surfaces with proper preparation and pretreatment in accordance with resin manufacturer's instructions.

## 2.07 ACCESSORIES

- A. Miscellaneous Sheet Metal Items: Provide flashings, trim, and closure strips 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.
- C. Sealants:
  - 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
  - 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
  - 3. Seam Sealant: Factory-applied, non-skinning, non-drying type.
- D. Underlayment - High-Temperature Type:
  - 1. Thickness: 40 mil (0.040 inch).
  - 2. Sheet Width: 36 inches.
  - 3. Water Vapor Permeance: 0.05 perm, maximum, measured according to ASTM E96/E96M.
  - 4. Low Temperature Flexibility: Unaffected when tested according to ASTM D1970/D1970M at minus 20 degrees F, 180 degree bend on 1 inch mandrel.
  - 5. Adhesion to Plywood: 5.0 pounds per inch of width, measured according to ASTM D903.
  - 6. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
  - 7. Acceptable Product:
    - a. GCP Applied Technologies; Ice & Water Shield HT: [www.gcpat.com](http://www.gcpat.com).



- E. Fasteners: Manufacturer's standard type to suit application; stainless steel.
  - 1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.
- F. Field Touch-up Paint: As recommended by panel manufacturer.

### **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. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.
- B. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.
- C. Protect surrounding areas and adjacent surfaces from damage during execution of this work.
- D. At locations 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 INSTALLATION**

- A. General: Install roofing system in accordance with 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, closure strips, and similar roof accessory items.
- C. Install specified underlayment on roof deck before installing preformed metal roof panels. Secure by methods acceptable to roof panel and underlayment manufacturer. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches and side and end laps a minimum of 3 inches.
- D. Roof Panels: Install metal roof panels in accordance with manufacturer's installation 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 panel manufacturer.
  - 2. Provide sealant tape or other approved joint sealer at lapped panel joints.
  - 3. Install sealant or sealant tape at end laps and side joints as recommended by metal roof panel manufacturer.

#### **3.04 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.

#### **3.05 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 074213**  
**METAL WALL PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Manufactured metal wall panel systems, including:
  - 1. Exterior wall panels.
  - 2. Related sheet metal flashings, closures, and trim.
- B. Design of wall panel system attachment to building structure to comply with specified requirements.

**1.02 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate placement of wall panel system anchors and back-up support framing.
  - 2. Coordinate installation of air barrier seals.
- B. Preinstallation Meeting: Convene one week before starting work of this Section.
  - 1. Require attendance by the installer and relevant sub-contractors.
  - 2. Include metal sheet manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.

**1.04 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Physical characteristics of components.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation instructions and recommendations.
- B. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
  - 1. Indicate panel numbering system.
  - 2. Differentiate between shop and field fabrication.
  - 3. Indicate substrates and adjacent work with which the wall system must be coordinated.
  - 4. Include large-scale details of anchorages and connecting elements.
  - 5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
  - 6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- C. Samples: Submit two samples of wall panel, 12 inches by 12 inches in size, illustrating finish color, sheen, and texture.

**1.05 QUALITY ASSURANCE**

- A. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of Work and licensed in California.
- B. Installer Qualifications: Company specializing in installing products specified in this Section with minimum three years of documented experience.
- C. Basis of Design: Specifications are based on wall panel types by specified basis of design manufacturer. Wall panel types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in design, composition, and profile are minor, and do not detract substantially from the indicated design intent.

### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store wall panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.
  - 1. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

### 1.07 FIELD CONDITIONS

- A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

### 1.08 WARRANTY

- A. Finish Warranty: Provide 10-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
- B. Special Warranty: Provide 5-year warranty covering water tightness and integrity of seals of metal wall panels. Complete forms in Owner's name and register with warrantor.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Basis of Design Manufacturers:
  - 1. Type 1: Western States Metal Roofing; Board and Batten Metal Siding: [www.westernstatesmetalroofing.com](http://www.westernstatesmetalroofing.com).
  - 2. Type 2: Berridge Manufacturing Company; Vee-Panel: [www.berridge.com/#sle](http://www.berridge.com/#sle).
- B. Other Acceptable Manufacturers:
  - 1. ATAS International, Inc.: [www.atas.com/#sle](http://www.atas.com/#sle).
  - 2. Centria, a Nucor Company: [www.centria.com/#sle](http://www.centria.com/#sle).
  - 3. MBCI, a Cornerstone Building Brands Company: [www.mbc.com/#sle](http://www.mbc.com/#sle).
  - 4. Taylor Metal Products: [www.taylormetal.com/#sle](http://www.taylormetal.com/#sle).

### 2.02 PERFORMANCE REQUIREMENTS

- A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
  - 1. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
  - 2. Design Pressure: In accordance with ASCE 7 and wind pressure criteria as specified on structural Drawings.
  - 3. Maximum Allowable Deflection of Panel:  $L/180$  for length(L) of span.
  - 4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
  - 5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
  - 6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
  - 7. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.

### 2.03 METAL WALL PANELS

- A. Exterior Wall Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of wall system.
  - 1. Profiles: As indicated on Drawings.
  - 2. Edge Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets or sealed with continuous sealant.
  - 3. Material: Precoated galvalume steel sheet, 22 gauge, 0.0299 inch minimum thickness.
  - 4. **Panel Coverages: As indicated on Drawings.**

- 5. Panel Thicknesses: As indicated on Drawings.
- 6. Colors: As selected by Architect from manufacturer's full line.
- B. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- C. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- D. Anchors: Galvanized steel.

#### **2.04 MATERIALS**

- A. Precoated Steel Sheet: Aluminum-zinc alloy-coated steel sheet, ASTM A792/A792M, Commercial Steel (CS)) or Forming Steel (FS), with AZ50/AZM150 coating; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
- B. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

#### **2.05 FINISHES**

- A. Fluoropolymer Coil Coating System: Manufacturer's standard multi-coat metal coil coating system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch.

#### **2.06 ACCESSORIES**

- A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.
- B. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 079200 for additional requirements.
- C. Fasteners: Manufacturer's standard type to suit application; steel, hot dip galvanized.
  - 1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.
- D. Field Touch-up Paint: As recommended by panel manufacturer.
- E. Bituminous Paint: Asphalt base.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that building framing members are ready to receive panels.
- B. Verify that air barrier has been installed over wall panel substrate.

#### **3.02 INSTALLATION**

- A. Install panels on walls and soffits in accordance with manufacturer's instructions.
- B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.
- C. Fasten panels to structural supports; aligned, level, and plumb.
- D. Locate joints over supports.
- E. Lap panel ends 2 inches, minimum.
- F. Use concealed fasteners unless otherwise indicated by Architect.
- G. Seal panel joints as specified to prevent weather penetration. Maintain neat appearance.

#### **3.03 TOLERANCES**

- A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.
- B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

#### **3.04 CLEANING**

- A. Remove site cuttings from finish surfaces.
- B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

**3.05 PROTECTION**

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

**END OF SECTION**

**SECTION 075423**  
**THERMOPLASTIC-POLYOLEFIN ROOFING (TPO)**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Thermoplastic membrane roofing system, including components specified.

**1.02 DEFINITIONS**

- A. Roofing Terminology: See ASTM D1079 for definition of terms related to roofing work not otherwise defined in this Section.
- B. LTRR: Long Term Thermal Resistance, as defined by CAN-ULC-S770.

**1.03 REFERENCE STANDARDS**

- A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems.
- B. ASTM C473 - Standard Test Methods for Physical Testing of Gypsum Panel Products.
- C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- E. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
- F. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- G. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
- H. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing.
- I. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- J. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- K. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- M. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- N. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C.
- O. CAN-ULC-S770 - Standard Test Method Determination of L-Term Thermal Resistance Of Closed-Cell Thermal Insulating Foams.
- P. FM (AG) - FM Approval Guide.
- Q. FM 4470 - Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction.
- R. FM DS 1-28 - Wind Design.
- S. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
  - 1. Require attendance by parties directly influencing quality of roofing work or affected by performance of roofing work.
  - 2. Notify Architect well in advance of meeting.

### 1.05 SUBMITTALS

- A. Product Data:
  - 1. Provide membrane manufacturer's printed data sufficient to show that components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
  - 2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.
  - 3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how components will be installed; where instructions allow installation options, clearly indicate which option will be used.
- B. Samples: Submit samples of each product to be used.
- C. Shop Drawings: Provide:
  - 1. The roof membrane manufacturer's standard details customized for this project for relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, fastener spacing, and drains.
  - 2. For tapered insulation, provide project-specific layout and dimensions for each board.
- D. Specimen Warranty: Submit prior to starting work.
- E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.
- F. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.
- G. Executed Warranty.

### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Provide roofing installer with the following:
  - 1. Current approval, license, or authorization as applicator by the manufacturer.
  - 2. At least five years experience in installing specified system.
- B. Basis of Design: Specifications are based on roofing systems by specified basis of design manufacturer and product(s). Roofing systems manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, weight, performance, and profile are minor, and do not detract substantially from the indicated design intent.

### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Store materials clear of ground and moisture with weather protective covering.
- C. Keep combustible materials away from ignition sources.

### 1.08 WARRANTY

- A. Comply with warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
- B. Warranty: Firestone Limited Warranty covering membrane, roof insulation, and other indicated components of the system, for the term indicated.
  - 1. Limit of Liability: No dollar limitation.
  - 2. Warranty Period: Full system warranty; Basis of Design manufacturer's 20 year Red Shield Limited Warranty covering membrane, roof insulation, membrane accessories, and metal edging and coping associated with membrane roofing system.
  - 3. Scope of Coverage: Repair leaks in the roofing system caused by:
    - a. Ordinary wear and tear of the elements.
    - b. Manufacturing defect in manufacturer's branded materials.
    - c. Defective workmanship used to install these materials.
    - d. Damage due to winds up to 90 mph.

- e. Hail up to 2 inches in diameter.
- 4. Not Covered:
  - a. Damage due to winds in excess of 90 mph.
  - b. Damage due hurricanes or tornadoes.
  - c. Intentional damage.
  - d. Unintentional damage due to normal rooftop inspections, maintenance, or service.
- C. Insulation Warranty: Separate insulation warranty with warranty term coinciding with roofing system warranty.
  - 1. Limit of Liability: No dollar limitation.
  - 2. Scope of Coverage: Provide replacement for insulation that warps, bows, or is on the point of causing a roof leak as a result of manufacturing defect.
- D. Metal Roof Edging: Manufacturer's full-system warranty for roof edge system, covering blow-off from winds up to 150 mph.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer: Elevate: [www.holcimelevate.com/#sle](http://www.holcimelevate.com/#sle).
  - 1. Roofing systems manufactured by the companies listed below are acceptable provided they are equivalent in materials and warranty conditions:
    - a. Carlisle Roofing Systems, Inc.: [www.carlisle-syntec.com](http://www.carlisle-syntec.com).
    - b. GAF: [www.gaf.com](http://www.gaf.com).
    - c. GenFlex Roofing Systems, LLC: [www.genflex.com](http://www.genflex.com).
- B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.
- C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.
  - 1. Metal roof edging products by other manufacturers are not acceptable.
  - 2. Field- or shop-fabricated metal roof edgings are not acceptable.

### **2.02 ROOFING SYSTEM DESCRIPTION**

- A. Roofing System: Thermoplastic polyolefin (TPO) single-ply membrane.
  - 1. Membrane Attachment: Fully self-adhered.
  - 2. Comply with applicable local building code requirements.
  - 3. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.
  - 4. Provide assembly complying with Factory Mutual Corporation (FM) Roof Assembly Classification, FM DS 1-28 and FM DS 1-29, and meeting minimum requirements of FM 1-90 wind uplift rating, unless otherwise specified to comply with greater wind uplift rating.
- B. Roofing System Components: Listed in order from top of roof down, unless otherwise indicated on Drawings:
  - 1. Membrane: Thickness as specified.
  - 2. Insulation Cover Board: Gypsum-based board, minimum 1/2 inch thick; cold adhesive attached.
  - 3. Insulation:
    - a. Maximum Board Thickness: 3 inches; use as many layers as necessary; stagger joints in adjacent layers.
    - b. Tapered: Slope as indicated; provide minimum R-value at thinnest point; place tapered layer on bottom.
    - c. Total R-Value: 29.9, minimum.
    - d. Top Layer: Polyisocyanurate foam board, non-composite; cold adhesive attached unless otherwise noted on Drawings at specific areas and locations.
    - e. Intermediate Layer(s), If Any: Polyisocyanurate foam board, non-composite; mechanically fastened.
    - f. Bottom Layer: Polyisocyanurate foam board, non-composite; mechanically fastened.
    - g. Crickets: Tapered insulation of same type as specified for top layer; slope as indicated.



### 2.03 MEMBRANE MATERIALS

- A. Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D6878/D6878M, with polyester weft inserted reinforcement and the following additional characteristics:
  - 1. Thickness: 0.060 inch (60 mil) plus/minus 10 percent, with coating thickness over reinforcement of 0.024 inch plus/minus 10 percent.
  - 2. Sheet Width: Provide the widest available sheets to minimize field seaming.
  - 3. Puncture Resistance: 265 lbf, minimum, when tested in accordance with FTM 101C - Method 2031.
  - 4. Membrane Color: White.
  - 5. Acceptable Product: UltraPly TPO.
- B. Membrane Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.
- C. Curb and Parapet Flashing: Same material as membrane, with encapsulated edge which eliminates need for seam sealing the flashing-to-roof splice; precut to 18 inches wide.
- D. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
  - 1. Thickness: 0.060 inch plus/minus 10 percent.
  - 2. Tensile Strength: 1,550 psi, minimum, when tested in accordance with ASTM D638 after heat aging.
  - 3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D638 after heat aging.
  - 4. Tearing Strength: 12 lbf, minimum, when tested in accordance with ASTM D1004 after heat aging.
  - 5. Color: Match primary sheet.
  - 6. Acceptable Product: UltraPly TPO Flashing.
- E. Tape Flashing: 5-1/2 inch nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.065 inch nominal.
  - 1. Acceptable Product: TPO QuickSeam Flashing.
- F. Bonding Adhesive: Neoprene and SBR rubber blend, formulated for compatibility with the membrane other substrate materials, including masonry, wood, and insulation facings.
  - 1. Acceptable Product: UltraPly Bonding Adhesive.
- G. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing.
  - 1. Acceptable Product: Pourable Sealer.
- H. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.
- I. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches wide by 0.10 inch thick.
  - 1. Acceptable Product: Firestone Termination Bar.
- J. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; available in white, gray, and tan.
  - 1. Acceptable Product: UltraPly TPO Cut Edge Sealant.
- K. General Purpose Sealant: EPDM-based, one part, white general purpose sealant.
  - 1. Acceptable Product: UltraPly TPO General Purpose Sealant.
- L. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc..
  - 1. Acceptable Product: UltraPly TPO Small and Large Pipe Flashing.
- M. Roof Walkway Pads: Non-reinforced TPO walkway pads, 0.130 inch by 30 inches by 40 feet long with patterned traffic bearing surface.
  - 1. Acceptable Product: UltraPly TPO Walkway Pads.

### 2.04 ROOF INSULATION AND COVER BOARDS

- A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with glass reinforced mat laminated to faces, complying with ASTM C1289 Type II Class 1, and the following additional characteristics:
  - 1. Thickness: As required to achieve specified r-value.

2. Tapered Boards: Slopes and configurations as indicated on Drawings; type as recommended by roofing system manufacturer for specified roofing system.
  3. Size: 48 inches by 96 inches, nominal.
    - a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches by 48 inches, nominal.
  4. R-value (LTTR):
    - a. 1.0 inch Thickness: 5.7, minimum.
    - b. 1.5 inch Thickness: 8.6, minimum.
    - c. 2.0 inch Thickness: 11.4, minimum.
    - d. 3.0 inch Thickness: 17.4, minimum.
    - e. 3.5 inch Thickness: 20.5, minimum.
  5. Compressive Strength: Minimum 20 psi when tested in accordance with ASTM C1289.
    - a. Minimum 60 psi under roof decking pavers where indicated on Drawings.
  6. UL-Classified and FM-approved for direct to steel deck applications.
  7. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
  8. Recycled Content: 19 percent post-consumer and 15 percent pre-consumer (post-industrial), average.
  9. Acceptable Product: ISO 95+ GL Polyisocyanurate Insulation.
- B. Gypsum-Based Cover Board: Non-combustible, water resistant gypsum core with embedded glass mat facers, complying with ASTM C1177/C1177M, and with the following additional characteristics:
1. Refer to Drawings for locations and areas, if any.
  2. Coordinate with manufacturer's warranty requirements; this system component may not be required by manufacturer, but may be required by Architect.
  3. Size: 48 inches by 96 inches, nominal.
    - a. Exception: Board to be attached using adhesive or asphalt may be no larger than 48 inches by 48 inches, nominal.
  4. Thickness: As specified in this Section.
  5. Surface Water Absorption: 2.5 g, maximum, when tested in accordance with ASTM C473.
  6. Spanning Capability: Recommended by manufacturer for maximum decking flute spans as indicated on Drawings.
    - a. Board Thickness: Consistent (same) thickness across all roof types with deck sheathing.
    - b. Cover Board: 5/8 inch.
  7. Surface Burning Characteristics: Flame spread index of 0 (zero), smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
  8. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
  9. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.
  10. Mold Growth Resistance: Zero growth, when tested in accordance with ASTM D3273 for minimum of 4 weeks.
  11. Pre-primed for better adhesion.
  12. Acceptable Product - Deck Sheathing: Georgia-Pacific DensDeck Prime Roof Board.
  13. Acceptable Product - Cover Board: GAF DensDeck StormX Prime Roof Board.
- C. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.
- D. Adhesive for Insulation Attachment: Type as required by roof membrane manufacturer for roofing system and warranty to be provided; use only adhesives furnished by roof membrane manufacturer.

## 2.05 METAL ACCESSORIES

- A. Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated; Firestone PTCF.
1. Wind Performance:
    - a. At least minimum required when tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3.
    - b. Provide product listed in FM (AG) with at least FM 1-90 rating.

2. Description: Coping sections allowed to expand and contract freely while locked in place on anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats; 8-inch wide splice plates with factory applied dual non-curing sealant strips capable of providing watertight seal.
3. Dimensions:
  - a. Wall Width: As indicated on Drawings.
  - b. Piece Length: Minimum 144 inches.
  - c. Curved Application: Factory fabricated in true radius.
4. Anchor/Support Cleats: 20 gauge, 0.036 inch thick prepunched galvanized cleat with 12 inch wide stainless steel spring mechanically locked to cleat at 72 inches on center.
5. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, corners, intersections, curves, pier caps, and end caps; minimum 14 inch long legs on corner, intersection, and end pieces.
6. Fasteners: Factory-furnished; electrolytically compatible; minimum pull out resistance of 240 lb for actual substrate used; no exposed fasteners.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. Commencement of work by Contractor constitutes acknowledgement that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.
- B. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
- C. Obtain relevant instructions and maintain copies at project site for duration of installation period.
- D. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- E. Perform work using competent and properly equipped personnel.
- F. Temporary closures, which ensure that moisture does not damage any completed section of new roofing system, are responsibility of applicator. Completion of flashings, terminations, and temporary closures to be completed as required to provide a watertight condition.
- G. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F.
- H. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
  1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
  2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
  3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- I. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- J. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

#### **3.02 EXAMINATION**

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.
- B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- C. Examine roof substrate to verify that it is properly sloped to drains.

- D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

### **3.03 PREPARATION**

- A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.
- B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.
- C. Before installing roofing system, install foamed-in-place insulation in deck flute locations where indicated on Drawings.
  - 1. Foamed-in-Place Insulation: Specified in Section 072119.
- D. Fill surface voids in immediate substrate that are greater than 1/4 inch wide with fill material acceptable insulation to membrane manufacturer.
- E. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

### **3.04 INSULATION AND COVER BOARD INSTALLATION**

- A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.
- B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.
- C. Lay roof insulation in courses parallel to roof edges.
- D. Neatly and tightly fit insulation to penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave roofing membrane unsupported over a space greater than 1/4 inch wide.
- E. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by Factory Mutual for FM Class specified in PART 2 and membrane manufacturer, whichever is more stringent.
- F. Cold Adhesive Attachment: Apply in accordance with membrane manufacturer's instructions and recommendations; "walk-in" individual roof insulation boards to obtain maximum adhesive contact.

### **3.05 SINGLE-PLY MEMBRANE INSTALLATION**

- A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
- B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
- C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.
- D. Install membrane adhered to the substrate, with edge securement as specified.
- E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.
- F. Edge Securement: Secure membrane at locations where membrane terminates or goes through an angle change greater than 2 in 12 inches using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
  - 1. Exceptions: Round pipe penetrations less than 18 inches in diameter and square penetrations less than 4 inches square.
  - 2. Ensure anchorage of membrane as intended by roofing manufacturer.

### **3.06 FLASHING AND ACCESSORIES INSTALLATION**

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

- B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the Drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
  - 1. Follow roofing manufacturer's instructions.
  - 2. Remove protective plastic surface film immediately before installation.
  - 3. Install water block sealant under the membrane anchorage leg.
  - 4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
  - 5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
  - 6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
  - 7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.
- C. Roofing Expansion Joints: Install as shown on Drawings and as recommended by roofing manufacturer.
- D. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at walls, curbs, parapets, skylights, and other vertical and sloped surfaces that roofing membrane abuts to; extend flashing at least 8 inches high above membrane surface.
  - 1. Use longest practical flashing pieces.
  - 2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
  - 3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
  - 4. Provide termination directly to the vertical substrate as shown on Drawings.
- E. Roof Drains:
  - 1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
  - 2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch of membrane to extend inside clamping ring past drain bolts.
  - 3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
  - 4. Apply sealant on top of drain bowl where clamping ring seats below the membrane.
  - 5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.
- F. Flashing at Penetrations: Flash penetrations passing through membrane; make flashing seals directly to penetration.
  - 1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
  - 2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches deep, with at least 1 inch clearance from penetration, sloped to shed water.
  - 3. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide a standard curb with flashing.
  - 4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
  - 5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F, protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.

### 3.07 FINISHING AND WALKWAY INSTALLATION

- A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
  - 1. Use specified walkway pads unless otherwise indicated.
  - 2. Do not install walkway pads within 10 feet of any roof edge or perimeter -- these areas require loose-laid pavers as walking surfaces.

- B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1 inch and maximum of 3 inches from each other to allow for drainage.
  - 1. If installation of walkway pads over field fabricated splices or within 6 inches of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches on either side.
  - 2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

**3.08 FIELD QUALITY CONTROL**

- A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).
- B. Perform corrections necessary for issuance of warranty.

**3.09 CLEANING**

- A. Clean contaminants generated by roofing work from building and surrounding areas including bitumen, adhesives, sealants, and coatings.
- B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this Section; comply with recommendations of manufacturers of components and surfaces.
- C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

**3.10 PROTECTION**

- A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

**END OF SECTION**

**SECTION 076200**  
**SHEET METAL FLASHING AND TRIM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including:
  - 1. Roof equipment supports.
  - 2. Formed metal copings.
  - 3. Sheet metal flashing and trim accessories.
  - 4. Other sheet metal flashing and trim items indicated on Drawings and not specified in other Sections.
- B. Sealants for joints within sheet metal fabrications.
- C. Design of attachment systems to comply with specified 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.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.
- F. SMACNA (ASMM) - Architectural Sheet Metal Manual.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate with roofing work for scheduling installation of counterflashing, rain drainage and similar items related to roofing.
  - 2. Coordinate with the work of Section 079200 for installation of related sealants.
- B. Sequencing: Do not proceed with installation of flashing and sheet metal work until substrate construction, cants, blocking, reglets, and other construction are ready to receive the work of this Section.

**1.04 SUBMITTALS**

- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- B. Samples: Submit two samples 6 by 6 inch in size illustrating each specified metal finish and color.

**1.05 QUALITY ASSURANCE**

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated or specified.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with three years of documented experience.

**1.06 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.

**1.07 WARRANTY**

- A. Extended Correction Period: Correct defective Work within a five year period after Date of Substantial Completion. Defective work includes failure of watertightness or seals.
- B. Manufacturer Warranty: Provide 20 year manufacturer warranty for prefinished sheet metal materials. Include coverage of degradation of metal finish beyond manufacturer's published limits.

## **PART 2 PRODUCTS**

### **2.01 SHEET METAL FLASHING AND TRIM ASSEMBLIES**

- A. General: Design sheet metal flashing and trim assemblies to physically protect roofing systems, roof accessories, and other building elements and systems from damage that would permit water leakage to building interior under all weather conditions.
- B. Flashing Assemblies: Design flashing assemblies to withstand structural movement, thermally induced movement, and exposure to wind and weather without failure or permanent deformation.
- C. Roof Edge Flashing and Coping Assemblies: Design assemblies to comply with the following requirements.
  - 1. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1, RE-1, RE-2, and RE-3 as applicable to positive and negative design wind pressure as defined by applicable code.
  - 2. Movement: Capable of withstanding structural movement, thermally induced movement, and exposure to wind and weather without failure or permanent deformation.

### **2.02 SHEET MATERIALS**

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.
  - 1. Applications: Flashings and counterflashings at roofing locations, concealed from public view, and similar locations.
- B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.
  - 1. Applications: Flashings and counterflashings exposed to public view, and where specifically indicated on Drawings.
  - 2. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
  - 3. Color: As selected by Architect from manufacturer's full colors.

### **2.03 FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats and starter strips of same material as exposed sheet, one gage thickness heavier than exposed sheet, and interlockable with exposed sheet.
  - 1. Provide continuous cleat strips for metal copings and flashings.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with lapped seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- H. Fabricate flashings to allow toe to extend minimum 2 inches over roofing terminations. Return and brake edges.
- I. Roof Equipment Supports: Cover raised bases and equipment supports with specified galvanized steel sheet. Fabricate with one inch riveted and soldered flat seams. Extend counterflashings over roof base flashings 4 inches minimum, and fold back bottom edge 1/2 inch. Where metal is penetrated for bolt or other fastener connections, use 4 lb sheet lead washers 2 inches larger than fastener hole.
  - 1. Comply with SMACNA (ASMM) Figure 8-11.
- J. Formed Metal Copings: Fabricate cross joints between coping sheets with 3/16 inch expansion joint between sheets, and 6 inch wide cover plate formed to profile of coping. Form cross joints in coping according to SMACNA (ASMM). Miter, seam, and seal corners of coping.
  - 1. Comply with SMACNA (ASMM) Figure 3-7A.



- K. Provide for thermal expansion/contraction of all exposed sheet metal work exceeding 15 feet in running length, except as otherwise indicated.
  - 1. Wall Copings, Flashings, and Trim: 10 feet maximum spacing, and not closer than 24 inches from corners and intersections.

## **2.04 ACCESSORIES**

- A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.
- B. Primer Type: Zinc chromate.
- C. Protective Backing Paint: Asphaltic mastic, ASTM D4479/D4497M, Type I.
- D. Concealed Sealants: Non-curing butyl sealant; compatible with metals and roofing system membranes.
- E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

## **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.
- C. Metal Wall Caps and Copings: Verify that wood grounds and nailing boards are secured to building framing sufficiently to resist specified pull-off resistance requirements.

### **3.02 PREPARATION**

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

### **3.03 INSTALLATION - GENERAL**

- A. Conform to Drawing details; if not detailed on Drawings, comply with standard details of the following:
  - 1. Steel Sheet Metal: SMACNA (ASMM).
- B. Lapped Seams - General: Overlap seams 4 inches, and seal with two continuous beads of non-curing butyl sealant spaced 2 inches apart and located 1 inch from end of each metal sheet.
- C. Cleats and Edge Strips: Secure edges of sheet metal members over 12 inches wide, and at other indicated locations with cleats. Fasten cleats at maximum 12 inches on center unless otherwise indicated. Provide continuous edge strips at eaves and gable ends for attaching exposed terminating edge of copings, gravel stops, or fascias. Provide minimum 1/8 inch butt joints as required to accommodate thermal movement.
- D. Formed Metal Copings: Extend front and back edges of coping down over continuous interlocking edge strip. Terminate rear edge with hemmed and folded edge over roof base flashings, or interlock with adjacent flashings as indicated. Miter, seam, and seal corners.
- E. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- F. Apply compatible sealant between metal flashings and roofing system flashings.
- G. Isolate sheet metal from cementitious materials and dissimilar metals with underlayment or protective coating that is compatible with all other materials with which it will come in contact.
- H. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- I. Seal metal joints watertight.

### **3.04 INSTALLATION - PRE-FINISHED SHEET METAL**

- A. Take special care in the handling and installation to avoid damage to finish.
- B. Remove protective film from each unit after installation, but not before adjacent construction is complete.

- C. Touch up minor damage or defects to match factory finish. Replace units which are excessively damaged as determined by Architect.

**END OF SECTION**

**SECTION 077233**  
**ROOF HATCHES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Roof hatches, including:
  - 1. Extension post assembly.
  - 2. Safety railing system.

**1.02 REFERENCE STANDARDS**

- A. 29 CFR 1910.23 - Ladders.
- B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate with installation of roofing system and related flashings for weather tight installation.

**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 detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

**1.05 QUALITY ASSURANCE**

- A. Basis of Design: Specifications are based on roof hatch and extension post types by specified basis of design manufacturer and product(s). Roof hatch and extension post types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, performance, weight, and profile are minor, and do not detract substantially from the indicated design intent.

**1.06 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.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. Bilco Company; Type S-E-50: [www.bilco.com/#sle](http://www.bilco.com/#sle).
- B. Other Acceptable Manufacturers:
  - 1. Babcock-Davis: [www.babcockdavis.com/#sle](http://www.babcockdavis.com/#sle).
  - 2. Dur-Red Products: [www.dur-red.com/#sle](http://www.dur-red.com/#sle).
  - 3. Nystrom, Inc.: [www.nystrom.com/#sle](http://www.nystrom.com/#sle).

**2.02 ROOF HATCHES**

- A. Roof Hatches - General: Factory-assembled steel 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 indicated on the Drawings.

3. Thermally Broken Hatches: Added insulation to frame and cover; outer frame and cover thermally isolated from inner frame and cover.
4. Size for Ladder Access: Single leaf; 30 by 37 inches, minimum clear opening.
- B. Extension Post Assembly: Extension post for mounting to top rungs of ladder.
  1. Finish: Powder coated; safety yellow color.
  2. Basis of Design Product:
    - a. Bilco Company; Model 1 Ladder Up: [www.bilco.com](http://www.bilco.com).
- 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: Galvanized steel, 14 gauge, 0.0747 inch thick.
  2. Finish: Factory prime paint.
  3. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
  4. Curb Height: 12 inches from finished surface of roof, minimum.
- D. Metal Covers: Flush, insulated, hollow metal construction.
  1. Capable of supporting 40 psf live load.
  2. Material: Galvanized steel; outer cover 14 gauge, 0.0747 inch thick, liner 22 gauge, 0.03 inch thick.
  3. Finish: Factory prime paint.
  4. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
  5. Gasket: Neoprene, continuous around cover perimeter.
- E. Safety Railing System: Roof hatch safety rail system mounted directly to curb without penetration of roofing system.
  1. Railing Size: As indicated on drawings.
  2. Railing: Comply with 29 CFR 1910.23 for ladder safety, with a safety factor of two.
  3. Self-Closing Gate: Comply with 29 CFR 1910.29 for safe egress and fall protection through hatch opening.
  4. Posts and Rails: Aluminum tubing.
  5. Gate: Same material as railing; automatic closing with latch.
  6. Finish: Manufacturer's standard, factory applied finish.
  7. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
  8. Mounting Brackets: Hot dipped galvanized steel, 1/4 inch thick, minimum.
  9. Fasteners: Stainless steel, Type 316.
  10. Basis of Design Product:
    - a. Bilco Company; Bil-Guard 2.0: [www.bilco.com/#sl](http://www.bilco.com/#sl).
- 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 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.
- B. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.

**3.04 ADJUSTING**

- A. Adjust hardware for smooth operation.

**3.05 CLEANING**

- A. Clean installed work to like-new condition.

**3.06 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 078400  
FIRESTOPPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Firestopping systems, materials, and accessories.
- B. Firestopping at electrical junction boxes in fire-rated walls.
- C. Firestopping of all penetrations and interruptions to fire rated assemblies.

**1.02 REFERENCE STANDARDS**

- A. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- C. ASTM E1399 - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
- D. 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.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- G. IFC (GUIDE) - International Firestop Council Recommended Guidelines for Evaluating Firestop Systems Engineering Judgements.
- H. ITS (DIR) - Directory of Listed Products.
- I. FCIA - Firestop Contractors International Association Manual of Practice.
- J. FM (AG) - FM Approval Guide.
- K. UL 1479 - Standard for Fire Tests of Penetration Firestops.
- L. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.
- M. UL (DIR) - Online Certifications Directory.
- N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- O. UL 1479 - Standard for Fire Tests of Through-Penetration Firestops.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate installation of firestopping systems with affected trades and adjacent work.
- B. Sequencing: Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.
  - 1. Do not cover or conceal firestopping installations until jurisdictional authority have inspected each installation.

**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.

**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), FM (AG), or ITS (DIR) 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](http://www.icc-es.org) will be considered as constituting an acceptable test report.
  3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Installer Qualifications: Company specializing in performing the work of this Section and:
1. Trained by manufacturer.
  2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
    - a. Verification of minimum three years documented experience installing work of this type.
    - b. Verification of at least five satisfactorily completed projects of comparable size and type.
    - c. Licensed by local authorities having jurisdiction (AHJ).
- C. Obtain firestop systems for each type and condition of penetration from a single manufacturer; intermixing of system components for each type and condition of penetration by different manufacturers is not permitted.
- D. Listed and tested assemblies and systems must be utilized, if they exist, before alternative systems requiring Engineering Judgement (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRRA) will be considered. Comply with IFC (GUIDE) and FCIA for EJ and EFRRRA design and submittal requirements.

### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver materials in original unopened containers identified with manufacturer's brand designation and applicable UL label.
- B. Do not use damaged or expired materials.

### **1.07 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.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
1. 3M Fire Protection Products: [www.3m.com/firestop](http://www.3m.com/firestop).
  2. A/D Fire Protection Systems Inc.: [www.adfire.com](http://www.adfire.com).
  3. Everkem Diversified Products, Inc.: [www.everkemproducts.com/#sle](http://www.everkemproducts.com/#sle).
  4. GCP Applied Technologies: [www.gcpat.com](http://www.gcpat.com).
  5. Hilti, Inc.: [www.hilti.com/#sle](http://www.hilti.com/#sle).
  6. Nelson FireStop Products: [www.nelsonfirestop.com](http://www.nelsonfirestop.com).
  7. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  8. RectorSeal: [www.rectorseal.com](http://www.rectorseal.com).
  9. Specified Technologies Inc.: [www.stifirestop.com/#sle](http://www.stifirestop.com/#sle).
  10. Tremco Commercial Sealants & Waterproofing: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  11. USG: [www.usg.com](http://www.usg.com).

### **2.02 MATERIALS - GENERAL**

- A. Firestopping Materials: Any materials meeting requirements specified.
  1. Comply with ASTM E814, UL 1479, and UL 2079 as applicable to achieve indicated fire ratings.
- B. Mold and Mildew Resistance: Provide firestopping 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: Use firestopping systems which are acceptable for those applications for which they are specifically designed. Use of other UL listed systems is Contractor's Option, subject to compliance with specified performance, regulatory, and quality assurance requirements.
  - 1. Where there is no specific tested and classified firestop system for an indicated condition, obtain from the firestopping system manufacturer an Engineering Judgement (EJ) or Equivalent Fire Resistance Rated Assembly (EFRR) according to IFC (GUIDE) and FCIA.
- B. Scope: Install firestopping at all locations requiring protected openings where piping, conduit, cables, sleeves, ductwork and similar items penetrate fire-resistive, fire-rated, and smoke assemblies, including but not limited to:
  - 1. Penetrations through wall, floor, and roof assemblies, including empty openings and openings containing penetrations.
  - 2. Membrane penetrations where items penetrate one side of the barrier assembly.
  - 3. Joints between rated assemblies to allow independent movement.
- C. Head-of-Wall (HW) 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 wall assembly.
  - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- D. 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: Provide systems that have been tested to show T Rating as indicated.
  - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
  - 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
  - 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- E. Fire Rated Construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces and types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.
- F. Other General Characteristics:
  - 1. Surface Burning: ASTM E84 and UL 723; flame spread less than 25, smoke developed less than 450.
  - 2. Air Leakage of Perimeter Firestopping Barriers and Penetrations: UL 2079; L-rating less than 2.0 cfm/sf or 5.0 cfm/lf as applicable to the type and location of joint.
  - 3. Durability and Longevity: Permanent.
  - 4. Side Effects During Installation: Non-toxic.
  - 5. Side Effects Under Fire Exposure: Non-toxic.
  - 6. Long Term Side Effects: None.

### 2.04 MATERIALS

- A. Putty Compound: 100 percent solids intumescent or vinyl-type formulation, free of asbestos, silicones, solvents, halogens, PCB's, and inorganic fibers; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84; paintable, not sensitive to freezing after set.
- B. Sealant Compound: One-part intumescent, endothermic, ablative, or elastomeric acrylic water-based calking material required by applicable UL Design; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84.
- C. Spray-Applied Compound: Water-based, flexible coating which dries to form a flexible seal; tested in accordance with ASTM E1399, complying with wind sway and thermal category, 500 cycles at minimum 10 cycles/minute.
- D. Foam Compound: Two-part, liquid-silicone elastomer formulated to foam in place when mixed; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84.



- E. Plastic Pipe Device: Intumescent strip material, factory or site fabricated in flexible metal collar with adjustable, screw-tightened stainless steel clamp; UL classified for use with PVC, CPVC, CCPVC, CCABS, PVDF, PP, PB, and FRPP plastic pipe.
- F. Fire-Safing Insulation: ASTM C612, Type I; high-melt mineral fibers and resinous binders formed into blankets, density not less than 4.0 lbs/cu ft, tested for 3-hour fire containment for required depths and dimensions.

## **2.05 ACCESSORIES**

- A. Provide necessary accessory materials specified in UL Design to achieve complete firestop system at each penetration. Include collars, sleeves, attachment devices, intumescent materials, and other items required.
- B. Primers, Sleeves, Forms, and Accessories: Type required for tested assembly design, and as recommended by firestopping manufacturer for specific substrate surfaces.
- C. Dam Material: Mineral fiberboard, mineral fiber matting, sheet metal, alumina silicate fire board, or other permanent material required as part of the firestopping system, or removable if not specifically required as part of the firestopping system.
- D. Retainers: Impale type clips to support mineral fiber safing blankets.

## **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 or damming materials required to arrest liquid material leakage.

### **3.03 INSTALLATION - GENERAL**

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Apply firestopping materials in sufficient thicknesses to achieve scheduled fire ratings, to uniform density and texture.
- C. Install material at openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.
- D. Remove dam material after firestopping material has cured only if dam material is not required as part of the firestopping system; otherwise dam material to remain permanently in place.
- E. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- F. Install labeling required by code.

### **3.04 CLEANING**

- A. Clean adjacent surfaces of firestopping materials.

### **3.05 PROTECTION**

- A. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

**SECTION 079200**  
**JOINT SEALANTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Joint sealants, including:
  - 1. Nonsag gunnable joint sealants.
  - 2. Self-leveling gunnable and pourable joint sealants.
- B. Joint backings and accessories.
- C. Field quality control of sealant installations, including:
  - 1. Post-occupancy inspection.

**1.02 DEFINITIONS**

- A. Nonsag Sealant: Permits application in joints on vertical surfaces without sagging or slumping.
- B. Self-leveling Sealant: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.

**1.03 REFERENCE STANDARDS**

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- B. ASTM C834 - Standard Specification for Latex Sealants.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- E. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- G. SWRI - Sealant, Waterproofing and Restoration Institute; Sealants: The Professionals' Guide.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sealant work with other work requiring sealants, and with other Sections referencing this Section; do not obstruct indicated or required moisture weepage systems under any circumstances.

**1.05 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical datasheets for each product to be used; include 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. Backing material recommended by sealant manufacturer.
  - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
  - 5. Substrates the product should not be used on.
  - 6. Substrates for which use of primer is required.
- 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.

**1.06 QUALITY ASSURANCE**

- A. Conform to SWRI recommendations for materials and installation.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years documented experience.

- C. System Compatibility: Assume responsibility for confirming that sealants are compatible with each other as a system, and also compatible with substrate surfaces with which they will be in contact, including but not limited to wall and sheathing surfaces, opening materials, other flashings and weather barrier materials.
  - 1. Assure that system components are compatible as specified prior to preparing and making specified submittals.
  - 2. Assume responsibility for removal of incompatible system components and installation of properly compatible components at no additional cost to Owner regardless of when incompatibility is discovered.

### **1.07 FIELD CONDITIONS**

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.
  - 1. Install sealants only when temperature is in lower third of manufacturer's recommended installation temperature range wherever joint width is affected by ambient temperature variations.
  - 2. Install sealants only when ambient temperature conditions can be maintained at or above 40 degrees F during installation and 48 hours immediately following installation.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in original, unopened containers or bundles with labels indicating manufacturer, product name and designation, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

### **1.09 WARRANTY**

- A. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.
- B. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturers - Joint Sealants: Following manufacturers are generally acceptable for sealant types specified in this Section, subject to compliance with other specified requirements.
  - 1. Adhesives Technology Corporation: [www.atcepoxy.com/#sle](http://www.atcepoxy.com/#sle).
  - 2. Bostik Inc.: [www.bostik-us.com/#sle](http://www.bostik-us.com/#sle).
  - 3. Dow: [www.dow.com/#sle](http://www.dow.com/#sle).
  - 4. Hilti, Inc.: [www.us.hilti.com/#sle](http://www.us.hilti.com/#sle).
  - 5. Master Builders Solutions: [www.master-builders-solutions.com/en-us/#sle](http://www.master-builders-solutions.com/en-us/#sle).
  - 6. Momentive Performance Materials, Inc. (formerly GE Silicones): [www.momentive.com/#sle](http://www.momentive.com/#sle).
  - 7. Pecora Corporation: [www.pecora.com/#sle](http://www.pecora.com/#sle).
  - 8. Sika Corporation: [www.usa.sika.com/#sle](http://www.usa.sika.com/#sle).
  - 9. Tremco Global Sealants: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  - 10. W.R. Meadows, Inc.: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
- B. Source Limitations: Furnish products of this Section produced by single manufacturer for each sealant and accessory type and application, subject to compliance with system compatibility requirements specified in this Section.

### **2.02 JOINT SEALANT APPLICATIONS**

- A. Sealant Scope:
  - 1. Exterior Joints:
    - a. Do not seal exterior joints unless indicated on Drawings as sealed.
    - b. Seal open joints except open joints indicated on Drawings as not sealed.

2. Interior Joints:
  - a. Do not seal interior joints indicated on Drawings as not sealed.
  - b. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
  - c. Seal the following joints:
    - 1) Joints between door frames and window frames and adjacent construction.
3. Do Not Seal:
  - a. Intentional weep holes in masonry, and weep systems in windows, storefronts, and similar fenestration elements.
  - b. Joints indicated to be covered with manufactured expansion joint cover assemblies or other sealing devices.
  - c. Joints where sealant installation is specified in other Sections.
- B. Exterior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
  1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
  2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
- C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
  1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
  2. Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
  3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant.
- D. Definitions of Special Use Areas:
  1. Interior Wet Areas: Include locker and shower rooms, restrooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

### 2.03 JOINT SEALANTS - GENERAL

- A. Hardness: As recommended by manufacturer for applications shown.
- B. Modulus of Elasticity: Provide lowest available modulus of elasticity for indicated requirements and consistent with exposure to weathering, indentation, abrasion and support of loading.
- C. Compatibility: Provide sealants, joint fillers, and related materials that are compatible with one another and with substrates and other materials to which they will be exposed in the joint system.
- D. Grade: For each application, provide grade of sealant complying with ASTM C920, and as recommended by manufacturer for indicated conditions, to achieve best possible performance. Types, grades, classes, and uses specified are for normal conditions.
- E. Colors: As selected from manufacturer's full line, unless otherwise specified.

### 2.04 NONSAG JOINT SEALANTS

- A. 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. Acceptable Products:
    - a. Adfast USA Inc.; ADSEAL KB 4800 Series: [www.adfastcorp.com/#sle](http://www.adfastcorp.com/#sle).
    - b. Everkem Diversified Products, Inc.; TruSil 100: [www.everkemproducts.com/#sle](http://www.everkemproducts.com/#sle).
    - c. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - d. Sika Corporation; Sikasil GP: [www.usa.sika.com/#sle](http://www.usa.sika.com/#sle).
- B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
  1. Movement Capability: Plus and minus 50 percent, minimum.
  2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
  3. Service Temperature Range: Minus 40 to 180 degrees F.
  4. Acceptable Products:
    - a. Master Builders Solutions; MasterSeal NP1: [www.master-builders-solutions.com/en-us/#sle](http://www.master-builders-solutions.com/en-us/#sle).
    - b. Pecora Corporation; DynaTrol II: [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - c. Sika Corporation; Sikaflex-2c NS: [www.usa.sika.com/#sle](http://www.usa.sika.com/#sle).
    - d. Tremco Commercial Sealants & Waterproofing; Dymonic 100: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).

- C. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multicomponent; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
  - 1. Movement Capability: Plus and minus 35 percent, minimum.
  - 2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
  - 3. Service Temperature Range: Minus 40 to 180 degrees F.
  - 4. Acceptable Products:
    - a. Sika Corporation; Sikaflex-1a: [www.usa.sika.com/#sle](http://www.usa.sika.com/#sle).
    - b. Sika Corporation; Sikaflex-2c NS: [www.usa.sika.com/#sle](http://www.usa.sika.com/#sle).
- D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
  - 1. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
  - 2. Acceptable Products:
    - a. Everkem Diversified Products, Inc.; SilTex 40: [www.everkemproducts.com/#sle](http://www.everkemproducts.com/#sle).
    - b. Franklin International, Inc.; Titebond Pro-Grade Plus Caulk: [www.titebond.com/#sle](http://www.titebond.com/#sle).
    - c. Pecora Corporation; AC-20 +Silicone: [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - d. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
    - e. Specified Technologies Inc.; Smoke N' Sound Acoustical Sealant: [www.stifirestop.com/#sle](http://www.stifirestop.com/#sle).
    - f. Top Gun, a brand of PPG Architectural Coatings; Top Gun 200: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
    - g. Tremco Commercial Sealants & Waterproofing; Tremflex 834: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
- E. Non-Curing Butyl Sealant: Solvent-based, single component, non-sag, non-skinning, non-hardening, non-bleeding; non-vapor-permeable; intended for fully concealed applications.
  - 1. Acceptable Products:
    - a. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - b. Tremco Commercial Sealants & Waterproofing; Acoustical/Curtainwall Sealant: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).

## 2.05 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
  - 1. Sealant Backing Rod, Closed-Cell Type:
    - a. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.
    - b. Size: 25 to 50 percent larger in diameter than joint width.
    - c. Applications: Exterior sealant joints, unless specifically recommended otherwise by sealant manufacturer for indicated application.
  - 2. Sealant Backing Rod, Open-Cell Type:
    - a. Cylindrical flexible sealant backings complying with ASTM C1330 Type O.
    - b. Size: 25 to 50 percent larger in diameter than joint width.
    - c. Applications: Interior sealant joints, unless specifically recommended otherwise by sealant manufacturer for indicated application.
  - 3. Sealant Backing Rod, Bi-Cellular Type:
    - a. Cylindrical flexible sealant backings complying with ASTM C1330 Type B.
    - b. Size: 25 to 50 percent larger in diameter than joint width.
    - c. Applications: Interior and exterior sealant joints, unless specifically recommended otherwise by sealant manufacturer for indicated application.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

- E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

### **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. Verify that backer rods are of the correct size.

#### **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. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
  - 1. Provide joints sized for width/depth ratios according to ASTM C1472.
- D. Multiple backer rods are not permitted; use single backer rod properly sized to 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 obstruct indicated or required moisture weepage systems under any circumstances.
- H. 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.
- I. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

#### **3.04 FIELD QUALITY CONTROL**

- 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 them.

#### **3.05 CLEANING**

- A. Clean exposed sealant surfaces immediately prior to Substantial Completion with cleaning solutions or other methods recommended and approved by sealant manufacturer, and which will not stain or damage adjacent surfaces; wipe dry.

#### **3.06 PROTECTION**

- A. Protect installed sealants from damage or failed adhesion due to subsequent construction operations.
- B. Do not permit traffic over self-leveling sealants that are exposed to construction or pedestrian traffic until Substantial Completion.

**END OF SECTION**

**SECTION 081113**  
**HOLLOW METAL DOORS AND FRAMES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Hollow metal doors and frames, including:
  - 1. Non-fire-rated hollow metal doors and frames.
  - 2. Hollow metal frames for wood doors.
  - 3. Fire-rated hollow metal doors and frames.
  - 4. Thermally insulated hollow metal doors with frames.
  - 5. Hollow metal borrowed lites glazing frames.

**1.02 DEFINITIONS**

- A. NAAMM/HMMA: National Association of Architectural Metal Manufacturers; Hollow Metal Manufacturers Association.
- B. SDI: Steel Door Institute.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- F. 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.
- G. 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.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- I. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.
- J. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- K. ITS (DIR) - Directory of Listed Products.
- L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
- M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
- N. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames.
- O. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.
- P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
- S. UL (DIR) - Online Certifications Directory.
- T. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate with wall construction for anchor placement.
  - 2. Coordinate installation of hardware.

### 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; and one copy of referenced standards/guidelines.
- B. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- C. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- 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.
- C. Inspect hollow metal products upon delivery for damage. Minor damage may be repaired provided refinishing is equal in all respects to new work and is acceptable to Architect; otherwise replace damaged items with new products as specified.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Any listed member of SDI or NAAMM/HMMA in good standing; [www.steeldoor.org](http://www.steeldoor.org) or [www.naamm.org/hmma](http://www.naamm.org/hmma).

### 2.02 GENERAL DOOR AND FRAME REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
  - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
  - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
  - 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
  - 4. Door Edge Profile: Manufacturer's standard for application indicated.
  - 5. Typical Door Face Sheets: Flush, unless otherwise indicated on Drawings.
  - 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on Drawings.
  - 7. 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. Prepare doors and frames for hardware in accordance with templates provided under Section 087100.
  - 8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) 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.
    - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) in non-corrosive locations, and at least A60/ZF180 (galvanized) for corrosive locations.
- B. 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; where two requirements conflict, comply with the most stringent.



### 2.03 HOLLOW METAL DOORS

- A. 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 1 - Full Flush.
    - d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
  - 2. Door Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
    - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
  - 3. Door Thermal Resistance: U-factor 0.70, maximum.
  - 4. Door Thickness: 1-3/4 inches, nominal.
  - 5. Top Closures for Outswinging Doors: Flush with top of faces and edges.
  - 6. Door Finish: Factory primed and field finished.
- B. 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 1 - Full Flush.
    - d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
  - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
  - 3. Door Finish: Factory primed and field finished.
- C. Interior Doors, 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 1 - Full Flush.
    - d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
  - 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
    - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
    - b. Attach fire rating label to each fire rated unit.
  - 3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
  - 4. Door Thickness: 1-3/4 inches, nominal.
  - 5. Door Finish: Factory primed and field finished.

### 2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. 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: 16 gauge, 0.053 inch, minimum.
  - 3. Frame Finish: Factory primed and field finished.
  - 4. Weatherstripping: Separate, see Section 087100.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
  - 1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
  - 2. Frame Finish: Factory primed and field finished.

- D. Interior Door Frames, Fire-Rated: Full profile/continuously welded type.
  - 1. Fire Rating: Same as door, labeled.
  - 2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
  - 3. Frame Finish: Factory primed and field finished.
- E. Borrowed Lites Glazing Frames: Construction and face dimensions to match typical interior metal door frames, and as indicated on Drawings; minimum 16 gauge thickness, unless otherwise indicated.

## **2.05 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

## **2.06 ACCESSORIES**

- A. Glazing: As specified in Section 088000.
- B. Removable Stops: Formed sheet steel, shape as indicated on Drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. 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.
- D. 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 INSTALLATION**

- A. Install doors and frames in accordance with manufacturer's instructions, regulatory requirements, and related requirements of specified door and frame standards or custom guidelines indicated.
  - 1. Install fire rated units in accordance with NFPA 80.
- B. Install door hardware as specified in Section 087100.

### **3.03 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.
- B. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge, corner to corner.

### **3.04 ADJUSTING**

- A. Adjust for smooth and balanced door movement.

### **3.05 SCHEDULE**

- A. Refer to Door and Frame Schedule on Drawings.

**END OF SECTION**

**SECTION 083100**  
**ACCESS DOORS AND PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Access doors and panels, including:
  - 1. Wall- and ceiling-mounted access units.
  - 2. Floor-mounted access door and frame units, interior.

**1.02 REFERENCE STANDARDS**

- A. ITS (DIR) - Directory of Listed Products.
- B. UL (FRD) - Fire Resistance Directory.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate installation with work of other trades, and obtain information on door sizes and exact locations from other trades.
  - 2. Coordinate placement of rough-in openings with Architect in tiled walls and gypsum board ceilings.
  - 3. Coordinate placement of access doors and panels with locations of toilet partitions and urinal screens so that doors or panels are not placed in conflict with partition or screen locations.

**1.04 SUBMITTALS**

- A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- B. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Activar Construction Products Group, Inc. - JL Industries: [www.activarcpg.com/#sle](http://www.activarcpg.com/#sle).
  - 2. ACUDOR Products Inc.: [www.acudor.com/#sle](http://www.acudor.com/#sle).
  - 3. Babcock-Davis: [www.babcockdavis.com/#sle](http://www.babcockdavis.com/#sle).
  - 4. Best Access Doors: [www.bestaccessdoors.com/#sle](http://www.bestaccessdoors.com/#sle).
  - 5. Cendrex, Inc.: [www.cendrex.com](http://www.cendrex.com).
  - 6. Elmdor Stonemen: [www.elmdorstoneman.com/#sle](http://www.elmdorstoneman.com/#sle).
  - 7. FF Systems, Inc.: [www.ffsystemsinc.com/#sle](http://www.ffsystemsinc.com/#sle).
  - 8. Karp Associates, Inc.: [www.karpinc.com](http://www.karpinc.com).
  - 9. MIFAB, Inc.: [www.mifab.com/#sle](http://www.mifab.com/#sle).
  - 10. Milcor by Commercial Products Group of Hart & Cooley, Inc.: [www.milcorinc.com](http://www.milcorinc.com).
  - 11. Nystrom, Inc.: [www.nystrom.com/#sle](http://www.nystrom.com/#sle).
  - 12. Studco Building Systems: [www.studcosystems.com/#sle](http://www.studcosystems.com/#sle).

**2.02 ACCESS DOOR AND PANEL ASSEMBLIES**

- A. Wall-Mounted Units:
  - 1. Panel Material: Steel; prime painted.
  - 2. Size: 12 inch by 12 inch, unless otherwise indicated on Drawings.
  - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
  - 4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
  - 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. Walls in Wet Areas:
  - 1. Locations: Include shower areas, family changing areas, bathhouse, and other locations indicated on Drawings.
  - 2. Panel Material: Stainless steel, Type 304.
  - 3. Size: 12 inch by 12 inch, unless otherwise indicated on Drawings.
  - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
  - 5. In All Wall Types: Surface mounted face frame and door surface flush with frame surface; gasketed door to frame all 4 sides.
  - 6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
  - 7. Masonry and Tile Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
- C. Fire Rated Walls: See Drawings for wall fire ratings.
  - 1. Panel Material: Steel; prime painted.
  - 2. Size: 12 inch by 12 inch, unless otherwise indicated on Drawings.
  - 3. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.
- D. Ceilings, Unless Otherwise Indicated: Same type as for walls in corresponding functional locations.

### **2.03 WALL- AND CEILING-MOUNTED ACCESS UNITS**

- A. 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. Door Style: Single thickness with rolled or turned in edges.
  - 2. Frames: 16-gauge, 0.0598-inch minimum thickness.
  - 3. Single Steel Sheet Door Panels: 16-gauge, 0.0625-inch minimum thickness.
  - 4. 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 ITS (DIR) or UL (FRD) as suitable for purpose indicated.
  - 5. Steel Finish: Primed.
  - 6. Stainless Steel Finish: No.4 brushed finish.
  - 7. Hardware:
    - a. Hinge for Fire-Rated-Units: 175 degree steel hinges with non-removable pin.
    - b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
    - c. Latch/Lock: Tamperproof tool-operated cam latch.
    - d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
    - e. Gasketing: Extruded neoprene, around perimeter of door panel.

### **2.04 FLOOR-MOUNTED ACCESS UNITS**

- A. Floor-Mounted Access Units: Factory fabricated, 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. Size: As indicated on drawings.
  - 2. Hardware: Stainless steel, Type 316.
    - a. Hinges: Removable pin.
    - b. Lock: Screw driver slot for quarter turn cam lock.
  - 3. Acceptable Product:
    - a. Bilco Company; Type K-4, aluminum, indoors: [www.bilco.com](http://www.bilco.com).
    - b. Substitutions: See Section 016000 - Product Requirements.

## **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.

- C. Review access panel locations during wall framing rough-in to confirm location is coordinated with interior wall finishes.

**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.
- D. Adjust hardware and panels for proper operation.
- E. Wet Locations: Seal frame to host wall all around; clear silicone sealant as specified in Section 079200.

**END OF SECTION**

**SECTION 083326.13**  
**FOLDING SECURITY GRILLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Folding metal grilles and operating hardware, electric operation.

**1.02 REFERENCE STANDARDS**

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, component connections and details, electrical equipment.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Maintenance Data: Indicate lubrication requirements and frequency.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installing overhead coiling grilles with three years documented experience approved by manufacturer.
- B. Basis of Design: Specifications are based on door types and model numbers by the specified basis of design manufacturer. Door types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in dimensions and profile are minor, and do not detract substantially from the indicated design intent.
  - 1. Comply with requirements specified in Section 01 4000 and Section .

**1.05 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. Dynamic Closures: [www.dynamicclosures.com](http://www.dynamicclosures.com): [www.overheaddoor.com](http://www.overheaddoor.com).
    - a. Model No. EL Series Paravent.

**2.02 GRILLE AND COMPONENTS**

- A. Grille: Aluminum; perforated panel curtain, folding and sliding on overhead track.
  - 1. Finish: Anodized, clear color.
  - 2. Lock: Inside cylinder lock.
  - 3. Manual operation.
  - 4. Mounting: As indicated on Drawings.
  - 5. Configuration: As indicated on Drawings.
- B. Overhead Track: Extruded aluminum channel, of profile to retain grille in place, mounting brackets of same metal.
- C. Floor Guide: Manufacturer's standard dustproof socket, set in floor slab.

**2.03 MATERIALS**

- A. Aluminum: ASTM B221 (ASTM B221M).

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that opening sizes, tolerances and conditions are acceptable.

#### **3.02 INSTALLATION**

- A. Install grille unit assembly 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.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

#### **3.03 TOLERANCES**

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

#### **3.04 ADJUSTING**

- A. Adjust grille, hardware and operating assemblies for smooth and noiseless operation.

#### **3.05 CLEANING**

- A. Clean grille and components.
- B. Remove labels and visible markings.

**END OF SECTION**

**SECTION 084313**  
**ALUMINUM STOREFRONT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Aluminum-framed storefront and curtain wall framing systems, including:
  - 1. Infill panels of metal and aluminum sheet.
  - 2. Aluminum doors and frames.
  - 3. Weatherstripping.
- B. Design engineering of framing system and load-bearing connections to building structural frame system.

**1.02 REFERENCE STANDARDS**

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- I. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- 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.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate attachment and seal of perimeter air and vapor barrier materials.
  - 2. Coordinate with installation of other components that comprise the exterior enclosure.

**1.04 SUBMITTALS**

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, door hardware, and internal drainage details.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- C. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- D. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

**1.05 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 at California.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

**1.06 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.

### 1.07 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

### 1.08 WARRANTY

- A. Extended Correction Period: Correct defective Work within a five year period after Date of Substantial Completion.
- B. Manufacturer Warranty: Provide 10 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 MANUFACTURERS

- A. Acceptable Manufacturers:
  1. Arcadia, Inc.: [www.arcadiainc.com/#sle](http://www.arcadiainc.com/#sle).
  2. EFCO Corporation: [www.efcocorp.com](http://www.efcocorp.com).
  3. Kawneer North America: [www.kawneer.com](http://www.kawneer.com).
  4. Manko Window Systems, Inc.: [www.mankowindows.com](http://www.mankowindows.com).
  5. Oldcastle BuildingEnvelope: [www.oldcastlebe.com](http://www.oldcastlebe.com).
  6. YKK AP America Inc: [www.ykkap.com](http://www.ykkap.com).

### 2.02 STOREFRONT SYSTEM

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
  1. Glazing Rabbet: For 1 inch insulating glazing.
  2. Finish: Class I color anodized.
    - a. Factory finish all surfaces that will be exposed in completed assemblies.
    - b. Finish Color: Black.
  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.
    - a. Fabricate individual system frame members, comp heads, sill pans, and other system components in single, continuous pieces; splices are not permitted unless specifically required by project installation conditions.
  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 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. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.
- B. Design Requirements: 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.
  1. Design Wind Loads: Comply with requirements of applicable code.
  2. Member Deflection: Limit member deflection to L/175 of clear span, 3/4 inch total, or to flexure limit of glass in any direction, whichever is less, with full recovery of glazing materials.

3. Provide reinforced mullion sections as may be required to comply with specified design requirements, for manufacturer's specified system.
- C. Condensation Resistance Factor of Framing: 60, minimum, measured in accordance with AAMA 1503.
- D. Overall U-factor Including Glazing: 0.41 Btu/(hr sq ft deg F), 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. Framing members for interior applications need not be thermally broken.
  2. Glazing Stops: Flush.
  3. Cross-Section: 2 x 4-1/2 inch nominal dimension.
  4. Sills Directly On Floor Cross-Section: 4-1/4 inch nominal height dimension, and depth to match framing system; with sill pans and all specified and required water management components.
  5. Corner Assemblies:
    - a. 90-Degree Corners: Manufacturer's standard combination of two pocket corner extrusions.
    - b. Corners Other Than 90 Degrees: Manufacturer's standard varying degree pocket corner extrusions with aluminum sheet metal fillers and closures.
  6. Reinforced Mullions: As required or recommended by manufacturer using manufacturer's standard profile of extruded aluminum with internal reinforcement of steel shaped structural section.
- B. Glazing: See Section 088000.
- C. Swing Doors: Glazed aluminum.
  1. Thickness: 1-3/4 inches.
  2. Top Rail: 5 inches wide; 7-1/2 inch wide where parallel arm closer is specified..
  3. Vertical Stiles: 5 inches wide.
  4. Intermediate Rail: 6 inches wide.
  5. Bottom Rail: 10 inches wide.
  6. Glazing Stops: Square.
  7. Finish: Same as storefront.
  8. Design exterior doors for one inch insulating glass units and thermally broken, and interior doors for 1/4 inch glass and non-thermally broken.
- D. Exterior Mullion Caps: Manufacturer's standard or custom-fabricated extrusions designed for installation on exterior mullions; sizes, shapes, and configurations as indicated on Drawings.

### 2.04 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209/B209M.
- C. Fasteners: Stainless steel.
- D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
  1. Size gaskets as required by manufacturer of glazing channel frame to provide proper pressure and bite on glazing units.
- F. Glazing Accessories: See Section 088000.

### 2.05 ACCESSORIES

- A. Reinforcement: Where fasteners screw-anchor into aluminum less than 1/8 inch thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive, pressed-in splined grommet nuts.
- B. Brackets: High-strength aluminum brackets and reinforcements where possible; otherwise provide non-magnetic stainless steel or galvanized steel complying with ASTM A123/A123M.
- C. Inserts: Cast iron, malleable iron, or 12 gage galvanized steel for required anchorage to concrete or masonry.

- D. Sill Pans: Manufacturer's standard extruded profile, thermally broken, designed to direct moisture to the exterior at sill conditions; including splice sleeves and continuously sealed end dams.
  - 1. Provide with sill pan clips for installation without the use of penetrating fasteners.
- E. Comp-Heads: Manufacturer's standard extruded profile, thermally broken, designed to accommodate minimum one inch deflection of building elements at head conditions.
- F. Water Deflectors: Manufacturer's standard internal system accessory specifically designed to route internal water drainage away from top surfaces of insulated glass units.
- G. Expansion Anchors: Lead shield or toothed steel, drilled in type expansion bolts for required attachment to concrete or masonry.
- H. Bituminous Coatings: Cold-applied asphalt mastic, compounded for 30 mil thickness per coat.
- I. Internal System Sealants and Gaskets: As recommended by manufacturer for use within the framing system for fabrication, assembly, and installation. Use products which will remain permanently elastic, non-shrinking, and waterproof.

## **2.06 FINISHES**

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- B. Class I Color Anodized Finish: AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick.
  - 1. Color: Black.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

## **2.07 HARDWARE**

- A. For each door, include weatherstripping and sill sweep strip.
- B. Door Hardware: See Section 08 7100, except as specified in this Section.
- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- E. Reinforce components internally for door hardware and door operators.
- F. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies, including exposed fasteners.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this Section.

### **3.02 INSTALLATION**

- A. Install wall system in accordance with manufacturer's instructions.
  - 1. Install storefronts in accordance with ASTM E2112.
- 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. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- G. Install sill pans with end dams; do not obstruct weep paths with sealants. Locate sill pan joints, if required, minimum 12 inches from centerline of vertical mullions. Seal to adjacent work to form water tight dam.

- H. Install comp-head units where detailed; do not secure comp-heads to primary storefront head frames.
- I. Install internal system sealants as installation progresses. Seal sill pan splices, end dams, water deflectors, and other components to ensure that proper water weepage paths are established and maintained within the system.
- 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 non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Location: Limit variation from plane or dimensioned location to 1/8 inch in 12 feet, non-cumulative, and 1/2 inch in overall length of member.

### **3.04 FIELD QUALITY CONTROL**

- A. Provide field testing of installed storefront system by AAMA accredited independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
  - 1. Perform a minimum of two tests in each designated area as directed by Architect.
  - 2. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
    - a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.

### **3.05 ADJUSTING**

- A. Adjust operating hardware 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, and take care to remove dirt from corners and to wipe surfaces clean.

### **3.07 PROTECTION**

- A. Protect installed products from damage until Date of Substantial Completion.

**END OF SECTION**

**SECTION 085659**  
**SERVICE WINDOW UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Service window units.

**1.02 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- E. ITS (DIR) - Directory of Listed Products.
- F. UL (DIR) - Online Certifications Directory.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate work with adjacent materials specified in other Sections and as indicated on Drawings and approved shop drawings.

**1.04 SUBMITTALS**

- A. Product Data: Submit manufacturer's product data for specified products indicating materials, operation, glazing, finishes, and installation instructions.
- B. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.
- C. Samples for Selection of Finishes:
  - 1. Color Anodized Finishes: Submit two samples, 4 inch by 4 inch in size illustrating metal finishes for each finish specified.
- D. Installer Qualification Statement.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- B. Basis of Design: Drawing details are based on window units by specified basis of design manufacturer. Similar window units by other acceptable manufacturers are permitted, subject to compliance with all specified performance characteristics, and provided that deviations in function, dimension, profile, and finish are minor, and do not detract from the indicated design intent.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.
- B. Store units in area protected from exposure to weather and vandalism.

**1.07 WARRANTY**

- A. Manufacturer Warranty: Provide manufacturer's warranty agreeing to repair or replace units and their components that fail in materials or workmanship within five years from Date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. Type 1: Ready Access, Inc.; West Coast Window Package: [www.ready-access.com/#sle](http://www.ready-access.com/#sle).
  - 2. Type 2: Ready Access, Inc.; Model 275 Single Panel Slider: [www.ready-access.com/#sle](http://www.ready-access.com/#sle).

- B. Other Acceptable Manufacturer:
  - 1. Quikserv Corp.: [www.quikserv.com/#sle](http://www.quikserv.com/#sle).

## 2.02 SERVICE WINDOW UNITS

- A. Window Type 1: Sliding, single horizontal.
  - 1. Operation: Self-closing.
  - 2. Window Size: Standard, as indicated on Drawings.
  - 3. Material: Aluminum.
    - a. Finish: Color anodized.
    - b. Finish Color: As selected from manufacturer's standard colors.
  - 4. Transom: As indicated on Drawings.
  - 5. Sidelights: As indicated on Drawings.
  - 6. Header: Manufacturer's standard type.
  - 7. Sill: Manufacturer's standard type.
  - 8. Accessories: Telescoping after-hours security bar.
- B. Window Type 2: Sliding, single horizontal.
  - 1. Operation: Self-closing.
  - 2. Window Size: Custom, as indicated on Drawings.
  - 3. Material: Aluminum.
    - a. Finish: Pigmented powder coating, manufacturer's standard type.
    - b. Finish Color: As selected from manufacturer's standard colors.
  - 4. Header: Manufacturer's standard type.
  - 5. Sill: Manufacturer's standard type.
  - 6. Accessories: Telescoping after-hours security bar.
- C. Glazing: Insulating glass, 1 inch overall depth, clear.
  - 1. Tempered safety glazing; low-e type
  - 2. See Section 08 8000.
- D. Air Curtain: Heated, for thermal and insect control, mounted on inside.
  - 1. Air Volume: 118 cfm, maximum.

## 2.03 ASSEMBLY COMPONENTS

- A. Windows: Factory-fabricated, finished, and glazed, with extruded aluminum frame and glazing stops; complete with hardware and anchors.
  - 1. Provide window units that are re-glazable from the secure side without dismantling the non-secure side of framing.
  - 2. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
  - 3. Apply factory finish to exposed surfaces.
  - 4. Apply bituminous paint to concealed metal surfaces in contact with cementitious or dissimilar materials.
  - 5. Wind Design: Design and size components to withstand dead loads and live loads caused by pressure and negative wind loads acting normal to plane of window as calculated in accordance with applicable code.
  - 6. Horizontal Sliding Windows: Top-hung operable sash; with thumb-turn release and drop down security bar.
  - 7. Self-Closing Operation: Manual open and self-closing with auto-locking handles and magnetic hold-open device.

## 2.04 MATERIALS

- A. Aluminum Extrusions: Minimum 1/8 inch thick frame and sash material complying with ASTM B221 and ASTM B221M.
- B. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

## **2.05 FINISHES**

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick.
  - 1. Color: Black.
- B. Pigmented Powder Coating System: AAMA 2605; powder coat finish; 2.5 mil minimum dry film thickness.
  - 1. Color: To be selected by Architect from manufacturer's full range.

## **2.06 ACCESSORIES**

- A. Electrical Components: 120 VAC, 60 Hz, 15 amps, single phase, unless otherwise indicated.
  - 1. Provide products UL (DIR) labeled and listed for intended purpose as specified.
- B. Air Curtain: Commercial grade, corrosion resistant clear anodized aluminum fan unit, ITS (DIR) listed, with rheostat air flow control.
  - 1. Heated: Heated air fan unit; switch control for room-temperature or heated air flow; 208/230 VAC, 60 Hz, single phase; 30 amp branch circuit.
- C. Hardware and Security Devices for Sliding Windows:
  - 1. Night Security Lock Bar: Sliding aluminum lock bar.
  - 2. Auto-Lock Handle: Stainless steel auto-locking handle on all self-closing sliders to prevent intrusion.
  - 3. Weatherstripping and Glazing Sealant: Factory applied.
  - 4. Handles: Stainless steel, manufacturer's standard profile and finish.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that window openings are ready for installation of windows.
- B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.
- C. Notify Architect if conditions are not suitable for installation of units; do not proceed until conditions are satisfactory.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install units in correct orientation (inside/outside or secure/non-secure).
- C. Anchor units securely in manner so as to achieve performance specified.
- D. Set sill members and sill flashing in continuous bead of sealant.
- E. Separate metal members from concrete and masonry using bituminous paint or with products recommended in writing by the manufacturer for this purpose.
- F. Connect electrical components to power source.

### **3.03 ADJUSTING**

- A. Adjust operating components for smooth operation while also maintaining a secure, weather-tight enclosure and a tight fit at the contact points; lubricate operating hardware.

### **3.04 CLEANING**

- A. Remove protective material from factory finished surfaces.
- B. Clean exposed surfaces promptly after installation without damaging finishes.

### **3.05 PROTECTION**

- A. Provide temporary protection to ensure that service and teller windows are without damage upon Date of Substantial Completion.

**END OF SECTION**

**SECTION 086223**  
**TUBULAR SKYLIGHTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Tubular skylights, consisting of skylight dome, reflective tube, and diffuser assembly.

**1.02 REFERENCE STANDARDS**

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- D. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
- E. ASTM D2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
- F. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
- I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- K. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings.

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets for each product.
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- B. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.
- C. 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.
- D. 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.

**1.04 QUALITY ASSURANCE**

- A. Basis of Design: Specifications are based on skylight types by specified basis of design manufacturer and product(s). Skylight types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, weight, performance, and profile are minor, and do not detract substantially from the indicated design intent.

**1.05 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.

#### 1.06 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.

#### 1.07 WARRANTY

- A. Manufacturer Warranty: Provide 10-year manufacturer warranty for tubular skylights. Complete forms in Owner's name and register with manufacturer.
- B. Manufacturer Warranty: Provide 3-year manufacturer warranty for electrical parts. Complete forms in Owner's name and register with manufacturer.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Basis of Design Manufacturer:
  - 1. Solatube International, Inc.: [www.solatube.com](http://www.solatube.com).
    - a. Model: S750DS-O-DP1-F8MRCCI-EXX-L2P.

#### 2.02 TUBULAR SKYLIGHTS

- A. Tubular Skylights: Transparent roof-mounted skylight dome and curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces.
  - 1. Fabrication and Assembly of Components: By single manufacturer.
  - 2. Non-Metal Parts: Flammability less than the following.
    - a. Roof-Top Components: Class B when tested in accordance with ASTM E108 or UL 790.
    - b. Self-Ignition Temperature: Greater than 650 degrees F, when tested in accordance with ASTM D1929.
    - c. Smoke Developed Index: Maximum of 450, when tested in accordance with ASTM E84; or maximum rating of 75, when tested in accordance with ASTM D2843.
    - d. Combustibility - Light Transmitting Parts: Burning extent of 1 inch or less (ICC Class CC-1), when tested in accordance with ASTM D635 in the thickness intended for use.
  - 3. Thermal Movement: Fabricate to allow for thermal movement resulting from temperature differential from minus 30 to 180 degrees F without damage to components, fasteners, or substrates.
- B. Roof Assemblies: Transparent, UV and impact resistant dome with curb-mounted roof cap supporting dome and top of tube.
  - 1. Glazing: Polycarbonate plastic, 1/8 inch minimum thickness.
  - 2. Low-Angled Sun Reflector: Concentric, light refracting etched lines, minimum 2 inches high, to improve light input when sun is low on horizon.
  - 3. Base: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube; specified manufacturer's recommended base flashing units for use on flat commercial roof applications to meet required curb height requirements.
  - 4. Base Height: 12 inches.
  - 5. Dome Ring: Attached to top of base section; 0.090 inch nominal thickness injection molded high impact ABS; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing; weather seal of medium density pile weather stripping.
- C. Reflective Tube: ASTM B209/B209M aluminum sheet, thickness between 0.015 inch and 0.020 inch.
  - 1. Extension Tubes: Basis of design manufacturer's Spectralight Infinity Extension Tubes and Flashing Turret Extensions.
  - 2. Interior Finish: Exposed interior surfaces of high reflectance specular finish; specular reflectance of 92, total reflectance 95 percent.
  - 3. Tube Diameter: 21 inches.
- D. Diffuser Assemblies: Supporting light transmitting surface at bottom termination of tube, with compression seal to minimize condensation and bug or dirt infiltration.
  - 1. Diffuser: Basis of design manufacturer's Prismatic diffuser with white trim.
  - 2. Diffuser Trim: Edge and attachment trim for diffuser lens; injection molded high impact ABS.

3. Diffuser Shape at Solid Ceilings: Round, same diameter as tube.
4. Lens: Flush frosted lens.
5. Lens Material: Polycarbonate plastic.
6. Lens Thickness: 0.038 inch, minimum.
7. Visible Light Transmission (VLT): 90 percent, minimum.
8. Seal: Closed cell EPDM foam rubber.

### **2.03 PERFORMANCE REQUIREMENTS**

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific tubular skylight:
  1. Product Type: Tubular Daylighting Device, Closed Ceiling (TDDCC).
  2. Performance Grade (PG): Equivalent to or greater than specified design pressure.
- B. Design Pressure (DP): In accordance with applicable codes.
- C. No permanent deflection in excess of 0.2 percent of span.
- D. Air Leakage: 0.30 cfm/sq ft maximum leakage for tubular skylight unit when tested at 1.57 psf pressure difference in accordance with ASTM E283/E283M.
- E. Water Resistance: No uncontrolled water leakage at 6.27 psf pressure differential with water rate of 5 gallons/h/sf, when tested in accordance with ASTM E331; designed to ensure that water will not accumulate inside assembly.

### **2.04 ACCESSORIES**

- A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.
- B. Sealant: Elastomeric, silicone or polyurethane; compatible with materials being sealed.

## **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 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 written instructions.
  1. Comply with ASTM E2112 for installation of weather barrier materials in conjunction with installation of skylights.
- B. Set roof assembly flashing in continuous bead of sealant.
- C. Seal joints exposed to weather in accordance with sealant manufacturer's written instructions.
- D. Conduct field test for water tightness; conduct water test in presence of Architect. Correct defective work and re-test until satisfactory.

### **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 088000**  
**GLAZING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Glazing, including:
  - 1. Insulating glass units.
  - 2. Monolithic glass.
- B. Glazing accessories, including:
  - 1. Glazing compounds.

**1.02 REFERENCE STANDARDS**

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM C1036 - Standard Specification for Flat Glass.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- K. GANA (GM) - GANA Glazing Manual.
- L. GANA (SM) - GANA Sealant Manual.
- M. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
- N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

**1.03 SUBMITTALS**

- A. Product Data on Insulating Glass Unit 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 in size, showing coloration and design of each type of glass specified.
- D. Warranty Documentation: 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 Glazing Manual and GANA Sealant Manual for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years documented experience.
- C. Provide each type of glass, primary sealant, and gasket from a single manufacturer with not less than five years documented experience in the production of required materials.

- D. Basis of Design: Specifications for certain glass products are based on specific glass types by the specified basis of design manufacturer. Glass types manufactured by other acceptable manufacturers are permitted, subject to compliance with all performance requirements; and provided that deviations in performance and coloration are minor, and do not detract substantially from the indicated design intent.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with manufacturer's instructions for shipping, handling, storing, and protection of glass and glazing materials. Exercise exceptional care to prevent edge damage to glass, and damage to coatings.
- B. Where insulating glass units will be exposed to substantial altitude changes during shipping, comply with manufacturer's recommendations for venting and sealing.

#### **1.06 FIELD CONDITIONS**

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
- C. Install sealants only when ambient temperature conditions can be maintained at or above 40 degrees F during installation and 48 hours immediately following installation.

#### **1.07 WARRANTY**

- A. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

### **PART 2 PRODUCTS**

#### **2.01 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. Design Pressure: Calculated in accordance with applicable codes.
  - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
  - 3. 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.
  - 4. Design glazing units to reliably perform and remain reliably engaged on all edges under all service and thermal stresses, including those associated with partial shading.
  - 5. Limit center of glass deflection to the lesser of 3/4 inch or L/100 (where L is short side dimension of glass unit), or flexure limit of glass, whichever is less, with full recovery of glazing materials.
  - 6. Assure and confirm compatibility of all materials in contact with each other.
  - 7. Glass thicknesses listed are minimum.
- B. 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.

#### **2.02 GLASS MATERIALS**

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
  - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
  - 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
  - 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
  - 4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
  - 5. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.

6. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

### 2.03 INSULATING GLASS UNIT APPLICATIONS

- A. Acceptable Insulating Glass Unit Manufacturers:
  1. Fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- B. General - Combined Requirements: If a particular glass unit is indicated to comply with more than one type of requirement, such as color, safety characteristics, or other requirements, comply with all specified requirements for each type as scheduled on Drawings.
- C. Insulating Glass Units: Types as indicated on Drawings.
  1. Basis of Design: As specified in this Section below.
  2. Durability: Certified by an independent testing agency to comply with ASTM E2190.
  3. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
  4. Warm-Edge Spacers: Low-conductivity thermoplastic with desiccant warm-edge technology design.
    - a. Spacer Width: As required for specified insulating glass units.
    - b. Spacer Height: Manufacturer's standard.
    - c. Acceptable Products:
      - 1) Quanex IG Systems, Inc.; Super Spacer TriSeal: [www.quanex.com/#sle](http://www.quanex.com/#sle).
      - 2) Technoform Glass Insulation; TGI-Spacer: [www.glassinsulation.us/#sle](http://www.glassinsulation.us/#sle).
      - 3) Substitutions: See Section 016000 - Product Requirements.
  5. Spacer Color: Black.
  6. Edge Seal:
    - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone sealant as secondary seal applied around perimeter.
    - b. Color: Black.
  7. Purge interpane space with dry air, hermetically sealed.
  8. Breather Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
    - a. Breather Tubes: Seal breather tubes upon installation in accordance with insulating glass fabricator's requirements.
  9. Space between lites filled with air.
  10. Total Thickness: 1 inch.
  11. Glazing Method: Dry glazing method, gasket glazing.
- D. Insulating Glass Units: Safety glazing.
  1. Applications:
    - a. Glazed lites in exterior doors.
    - b. Glazed sidelights and panels next to doors.
    - c. Locations required by applicable federal, state, and local codes and regulations.
    - d. Other locations specified or indicated on Drawings.
  2. Glass Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.

### 2.04 BASIS OF DESIGN - INSULATING GLASS UNITS

- A. Basis of Design - Insulating Glass Units: Vision glazing, with low-e coating.
  1. Applications: Exterior insulating glass glazing unless otherwise indicated.
  2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
  3. Basis of Design - Guardian Glass, LLC: [www.guardianglass.com/#sle](http://www.guardianglass.com/#sle).
  4. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
    - a. Low-E Coating: SunGuard SNX 51/23 on #2 surface.
    - b. Glass: Clear.

5. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
  - a. Coating: No coating on inboard lite.
  - b. Glass: Clear.

## 2.05 MONOLITHIC GLAZING UNITS

- A. 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, nominal, unless otherwise indicated on Drawings.
  5. Glazing Method: Wet/dry glazing method, preformed tape and sealant.

## 2.06 GLAZING COMPOUNDS

- A. General Requirements:
  1. Provide black exposed glazing accessory materials, unless specifically indicated otherwise.
  2. Provide materials of hardness as recommended by manufacturer for required application and condition of installation in each case. Provide only compounds which are known to be fully compatible with surfaces contacted, including glass products, seals, and glazing channel surfaces.
- B. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
- C. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; black color.
  1. Butt Glazing Applications: Clear color, unless otherwise indicated or specified

## 2.07 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 of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch 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 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.
  3. Spacer Rod Diameter: As required for application.
- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
  1. Size gaskets as required by manufacturer of glazing channel frame to provide proper pressure and bite on glazing units.

## 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 the minimum required face and edge clearances are being provided.
- C. 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.
- 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 within maximum of 24 hours 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.
- D. Sealed Insulating Glass Units: Seal breather tubes immediately prior to glass unit installation with bead of silicone sealant according to sealed insulating glass unit manufacturers requirements; do not crimp, bend, or otherwise damage breather tubes.

### **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. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. 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, and paint.

### **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 from corners; do not block weep paths.
- 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 - WET/DRY GLAZING METHOD (PREFORMED TAPE AND SEALANT)**

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.
- B. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- C. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- D. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners; do not block weep paths.
- E. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.
- F. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.
  - 1. Place glazing tape on glazing pane of unit with tape flush with sight line.
- G. Fill gap between glazing and stop with butyl type sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.
- H. Apply cap bead of butyl type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

### **3.06 CLEANING**

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent 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.

**3.07 PROTECTION**

- A. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

**END OF SECTION**



**SECTION 088300**  
**MIRRORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Glass mirrors, including:
  - 1. Annealed float glass with safety backing.
  - 2. Mounting accessories.

**1.02 REFERENCE STANDARDS**

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- B. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- C. ASTM C1036 - Standard Specification for Flat Glass.

**1.03 SUBMITTALS**

- A. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- B. Samples: Submit two samples, 12 by 12 inch in size, illustrating mirrors design, edging, and coloration.

**1.04 QUALITY ASSURANCE**

- A. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

**1.05 WARRANTY**

- A. Manufacturer Warranty: 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: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
  - 1. Thickness: 1/4 inch, minimum.
  - 2. Edges: Polished.
  - 3. Safety Backing: Pressure-sensitive, adhesive-coated film with embedded woven scrim, complying with requirements of ANSI Z97.1 and 16 CFR 1201; 60 inch roll width, applied to entire back surfaces of wall mirror panels.
  - 4. Sizes: As noted on Drawings.

**2.02 ACCESSORIES**

- A. Mirror Attachment Accessories: Stainless steel clips or J-profile channels.
- B. Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
  - 1. Application Temperature: Minus 35 to 140 degrees F at contact surfaces.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that mounting surfaces are clean, free of obstructions, and ready for installation of mirrors.

**3.02 PREPARATION**

- A. Clean contact surfaces and wipe dry.

**3.03 INSTALLATION**

- A. Install mirrors in accordance with manufacturer's 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 clips or channel assemblies, and anchor rigidly to wall construction.

**3.04 CLEANING**

- A. Remove wet glazing materials from finish surfaces.
- B. Remove labels after work is complete.
- C. Clean mirrors and adjacent surfaces.

**END OF SECTION**

**SECTION 090561**  
**FLOORING PREPARATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section applies to all floors identified in the contract documents as to receive the following types of floor coverings:
  - 1. Resilient tile and sheet flooring.
  - 2. Thin-set tile.
  - 3. Other adhesively applied flooring.
- 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. 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.

**1.02 REFERENCE STANDARDS**

- A. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- B. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

**1.04 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 Reports:
  - 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.

**1.05 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.
- D. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this Section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years of experience installing moisture emission coatings.

#### **1.06 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.

#### **1.07 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 or more than 85 degrees F.
- 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.

#### **1.08 WARRANTY**

- A. Moisture Emission Reducing Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years, minimum.
  1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- B. Floor Sealer: Clear, penetrating sealer for application to surfaces of concrete intended by its manufacturer to vapor-proof, seal, harden, dust-proof, and weather-proof concrete slabs by closing capillary system of concrete, and eliminating route of moisture vapor emission allowing application of moisture-sensitive adhesives and coatings.
  1. Confirm compatibility of floor sealer with flooring manufacturer's adhesives and other affected installation materials.
  2. Comply with ASTM C309 and ASTM C1315, Type I Class A or C.
  3. VOC Content: Less than 100 g/L.
  4. Solids Content: 25 percent, minimum.
  5. Acceptable Products:
    - a. Allied Construction Technologies, Inc.; AC-Tech 2170 FC Vapor Reducing System: [www.actechperforms.com](http://www.actechperforms.com).
    - b. Creteseal Concrete Waterproofing Products, Inc.; Creteseal 2000: [www.creteseal.com](http://www.creteseal.com).
    - c. Floor Seal Technology, Inc.; VaporSeal 309 System: [www.floorseal.com](http://www.floorseal.com).

### **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 and one test in each additional 1000 square feet, 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. Specified remediation, if required.
  6. Patching, smoothing, and leveling, as required.
  7. Other preparation specified.
  8. Adhesive bond and compatibility test.
- B. 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.

### **3.02 PRELIMINARY CLEANING**

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

### **3.03 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 per 24 hours.
- F. Report: Report the information required by the test method.

### **3.04 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:
  1. 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.
  2. 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.
- D. Report: Report the information required by the test method.

### **3.05 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.
  1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
  2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch 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.
  3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.

### **3.06 PREPARATION**

- A. See individual floor covering Section(s) for additional requirements.

- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

**3.07 ADHESIVE BOND AND COMPATIBILITY TESTING**

- A. Comply with requirements and recommendations of floor covering manufacturer.

**3.08 APPLICATION OF REMEDIAL FLOOR COATING**

- A. General: Comply with requirements and recommendations of coating manufacturer.
- B. Apply floor sealer coating in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

**3.09 PROTECTION**

- A. Cover prepared floors with building paper or other durable covering.
- B. Maintain protective covering until Substantial Completion.

**END OF SECTION**

**SECTION 092116**  
**GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal stud framing.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.

**1.02 RELATED REQUIREMENTS**

**1.03 REFERENCE STANDARDS**

- A. AISI S220 - North American Standard for Cold-Formed Steel Framing - Nonstructural Members.
- B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing.
- C. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- F. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- I. 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.
- J. 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.
- K. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.
- L. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- M. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- N. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.
- O. GA-216 - Application and Finishing of Gypsum Panel Products.

**1.04 SUBMITTALS**

- A. Product Data:
  - 1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.
  - 2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- B. Stud Framing: Products that do not comply with AISI S220 or ASTM C754 are not permitted.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.
- B. Store metal products to prevent corrosion, under cover and above grade.
- C. Handle gypsum boards to prevent damage to ends, edges, and surfaces.

## 1.07 FIELD CONDITIONS

- A. Maintain ambient temperatures at not less than 40 degrees F for non-adhesive attachment of gypsum board, and not less than 50 degrees F for adhesive attachment.
- B. Maintain ambient temperatures at not less than 50 degrees F for a period 48 hours before gypsum board finishing, during installation, and after installation of board materials.

## PART 2 PRODUCTS

### 2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216 as applicable.
- B. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions in accordance with ASCE 7 for Seismic Design Category D, E, or F as applicable, and complying with the following:
  - 1. Local authorities having jurisdiction.

### 2.02 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
- B. Acceptable Manufacturers:
  - 1. ClarkDietrich: [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
  - 2. Jaimes Industries: [www.jaimesind.com/#sle](http://www.jaimesind.com/#sle).
  - 3. CEMCO; California Expanded Metal Company: [www.cemcosteel.com](http://www.cemcosteel.com).
  - 4. MarinoWARE: [www.marinoware.com/#sle](http://www.marinoware.com/#sle).
  - 5. Phillips Manufacturing Co.: [www.phillipsmfg.com/#sle](http://www.phillipsmfg.com/#sle).
  - 6. R-stud: [www.rstud.com/#sle](http://www.rstud.com/#sle).
  - 7. SCAFECO Corporation: [www.scafco.com/#sle](http://www.scafco.com/#sle).
  - 8. Steel Construction Systems: [www.steelconsystems.com/#sle](http://www.steelconsystems.com/#sle).
- C. Metal Framing - General: Provide framing materials complying with specified standards; galvanized sheet steel, 25 gage unless specified, noted, scheduled, or detailed otherwise.
- D. Non-Structural Framing Accessories:
  - 1. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

### 2.03 CEILING SUSPENSION SYSTEM COMPONENTS

- A. Gypsum Board Interior Ceiling Suspension System:
  - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for conditions and spacing required.
  - 2. Ceiling Hanger Wire: ASTM A641/A641M, Class 1 coating; soft temper, pre-stretched, yield stress load at least three times design load, but not less than 12 gage.
  - 3. Ceiling Hanger Angles: Not less than 7/8 x 7/8 inch x 16 gage galvanized steel formed angles; ASTM A653/A653M, G90 coating, with minimum 5/16 diameter bolted connections.
  - 4. Ceiling Hanger Anchors: Size for three times imposed loads, as determined by ASTM E488/E488M; corrosive resistant materials with loops or holes for attachment of hanger wires.

### 2.04 BOARD MATERIALS

- A. Acceptable Manufacturers - Gypsum-Based Board:
  - 1. American Gypsum Company: [www.americangypsum.com/#sle](http://www.americangypsum.com/#sle).
  - 2. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 3. Georgia-Pacific Gypsum: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
  - 4. Gold Bond Building Products, LLC provided by National Gypsum Company: [www.goldbondbuilding.com/#sle](http://www.goldbondbuilding.com/#sle).
  - 5. PABCO Gypsum: [www.pabcogypsum.com/#sle](http://www.pabcogypsum.com/#sle).
  - 6. USG Corporation: [www.usg.com/#sle](http://www.usg.com/#sle).
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  - 1. Applications: Use for vertical surfaces and ceilings, unless otherwise indicated.



2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. Thickness: As indicated on Drawings.
- C. Water-Resistant Gypsum Board: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  2. Thickness: As indicated on Drawings.

## **2.05 INSTALLATION AND FINISHING ACCESSORIES**

- A. Special Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
- B. Joint Materials: ASTM C475/C475M, and as recommended by gypsum board manufacturer for project conditions.
1. Interior Gypsum Board Tape: 2 inch wide, creased paper tape for joints and corners.
  2. Joint Compound for Wet Locations: Chemical quick-setting type for first 2 coats, and vinyl type top coat specially formulated for finishing topping.
- C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this Section before commencing work of this Section.

### **3.02 BOARD INSTALLATION**

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
1. Space fasteners in accordance with ASTM C840 and manufacturer's recommendations.
  2. Install interior wall and partition boards in accordance with requirements of referenced installation standards, except where fire or sound rating requires a particular direction; comply with the method stated in the tested assembly data.
  3. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
- B. Single-Layer Non-Rated Applications: Install gypsum board in most economical direction, 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. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- E. Installation on Metal Framing: Use screws for attachment of gypsum board.

### **3.03 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Corner Beads: Install at external corners, using longest practical lengths.
- B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

### **3.04 JOINT TREATMENT**

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
1. Level 4: Walls and ceilings to receive paint finish, unless otherwise indicated or specified.
  2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
  3. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

- C. 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.
  - 2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
  - 3. Taping, filling, and sanding are not required at base layer of double-layer applications.

### **3.05 TOLERANCES**

- A. Maximum Variation of Framing Location and Alignment in Plan and Elevation: 1/4 inch in any direction.
- B. Maximum Variation of Framing from True Plumbness and Flatness: 1/8 inch in 10 feet.
- C. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

### **3.06 PROTECTION**

- A. Protect installed gypsum board assemblies from subsequent construction operations.

**END OF SECTION**

**SECTION 092513.23**  
**INTERIOR ACRYLIC POLYMER COATING SYSTEM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Acrylic plaster ceiling system.
- B. Interior applications.
- C. Backer board substrate.

**1.02 REFERENCE STANDARDS**

- A. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
- B. ASTM C297/C297M - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions.
- C. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
- D. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- E. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate perimeter sealant installation to produce water-resistant ceiling system.
  - 2. Coordinate sealants at junction with dissimilar materials.

**1.04 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical information including specifications, standard details, basic materials, installation instructions for the system, and test reports from an independent testing laboratory certifying test results for bond integrity and material properties.
- B. Samples: Submit two samples, 12 x 12 inches each, indicating finish coat texture and color selected from manufacturer's standards. Apply samples to specified substrate board, using applicator, materials, tools, and techniques proposed for installation.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of experience.
- B. Obtain materials for system from either a single manufacturer, or from manufacturers approved by the system manufacturer as compatible with other system components.
- C. Basis of Design: Specifications are based on system types by specified basis of design manufacturer and product(s). System types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, weight, and system components are minor, and do not detract substantially from the indicated design intent.

**1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver materials in original, unopened packages and containers, clearly marked with manufacturer's name, brand name, and description of contents.
- B. Store materials in clean, dry, well ventilated area in accordance with manufacturer's recommendations. Maintain ambient temperature above 40 degrees F.

**1.07 FIELD CONDITIONS**

- A. Apply system materials in ambient temperatures above 40 degrees F.
- B. Do not apply system to damp or wet substrates.
- C. Maintain minimum ambient temperature of 40 degrees F for minimum 24 hours after installation.

**1.08 WARRANTY**

- A. Correct defective Work within a three year period after Date of Substantial Completion.

- B. Warranty: Include coverage of materials and workmanship against cracking, crazing, chalking, de-lamination, and color fading.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. STO Corp.; Specification 1200 StoQuik: [www.stocorp.com](http://www.stocorp.com).
- B. Other Acceptable Manufacturers:
  - 1. Dryvit Systems, Inc.; [www.dryvit.com](http://www.dryvit.com).
  - 2. Omega Products International, Inc.; [www.omega-products.com](http://www.omega-products.com).
  - 3. Parex, Inc.: [www.parex.com](http://www.parex.com).

### **2.02 SYSTEM DESCRIPTION**

- A. Site fabricated interior ceiling finish system consisting of fiberglass-mat faced backer board or cementitious backer board approved by finish system manufacturer; fabric reinforcing, base coat, and finish coat. Use system manufacturer's standard products regularly used in producing specified system.
  - 1. Bond Integrity: Free from bond failure within system components, or between system and supporting wall construction resulting from exposure to fire, wind loads, weather, or other in-service conditions.
  - 2. Water Penetration: ASTM E331; no water penetration beyond the plane of the base coat/insulation board interface after 15 minutes at 6.24 psf, or 20 percent of positive design wind pressure, whichever is greater.
  - 3. Water Resistance: ASTM D2247; no deleterious effects at 14 day exposure.
  - 4. Mildew Resistance: ASTM D3273; no growth supported during 28 day exposure period.
  - 5. Tensile Adhesion: ASTM C297/C297M; no failure in the adhesive, base coat, or finish coat; minimum 5 psi tensile strength before and after freeze/thaw and accelerated weathering tests.

### **2.03 MATERIALS**

- A. Fiberglass-Mat Faced Backer Board: Coated, silicone impregnated, glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
  - 1. Standard Type Thickness: 5/8 inch.
  - 2. Acceptable Product:
    - a. Georgia-Pacific Gypsum, LLC; DensShield Tile Backer.
- B. Cementitious Backer Board: High density, cementitious, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
  - 1. Acceptable Products:
    - a. National Gypsum Company; PermaBase Cement Board: [www.nationalgypsum.com/#sle](http://www.nationalgypsum.com/#sle).
    - b. USG; Durock Brand Tile Backer: [www.usg.com](http://www.usg.com).
- C. Base Coat: Fiber-reinforced, acrylic product that is compatible with backer board and reinforcing mesh.
- D. Finish Coat: Water-based, air curing, acrylic finish with integral color and texture.
  - 1. Texture: Fine.
  - 2. Color: As indicated on Drawings.

### **2.04 ACCESSORIES**

- A. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.
- B. Trim: Manufacturer's standard PVC or galvanized steel trim accessories, as required for a complete installation.
- C. Sealants: As specified in Section 079200.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates with applicator present to determine satisfactory condition of substrates for installation of system. Proceed with installation only when satisfactory conditions are present.

### **3.02 PREPARATION**

- A. Protect adjacent work and substrates from moisture deterioration and soiling resulting from application of system. Provide temporary covering and other protection required to prevent damage to other work.
- B. Protect work areas and substrate construction from adverse weather during installation. Prevent infiltration of moisture behind system, and deterioration of substrates.
- C. Perform substrate preparation and cleaning procedures in conformance with system manufacturer's instructions for indicated substrate conditions.
- D. Apply patching compound and sealers as required to produce substrates meeting requirements of system manufacturer.
- E. Carefully mix, prepare, and apply materials in accordance with manufacturer's specifications.

### **3.03 INSTALLATION**

- A. Install system in accordance with manufacturer's instructions.
- B. Install backer boards and tape joints to comply with manufacturer's recommendations for type of application indicated.
  - 1. Use galvanized or stainless steel fasteners.
- C. Apply base coat to minimum thickness specified by system manufacturer. Fully embed reinforcing fabric in wet base coat, with fabric continuous at corners, and lapped or otherwise treated at joints to comply with system manufacturer's specifications. Do not carry reinforcing fabric across expansion joints.
- D. Apply finish coat over dry base coat to minimum thickness specified by system manufacturer to produce uniform finish and specified texture.
- E. Install sealants as specified in Section 079200.

### **3.04 CLEANING**

- A. Clean finish surfaces in accordance with manufacturer's instructions.

### **3.05 PROTECTION**

- A. Protect installed coating system from subsequent construction operations.
- B. Do not permit traffic over unprotected finish surfaces.

**END OF SECTION**

**SECTION 093000**  
**TILING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Tiling applications, including:
  - 1. Tile for floor applications.
  - 2. Tile for wall applications.
  - 3. Tile for shower floors and receptors.
- B. Tiling accessories, including:
  - 1. Non-ceramic trim.

**1.02 REFERENCE STANDARDS**

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
- B. ASTM C241/C241M - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.
- C. ASTM C499 - Standard Test Method for Facial Dimensions and Thickness of Flat, Rectangular Ceramic Wall and Floor Tile.
- D. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

**1.03 DEFINITIONS**

- A. Module Size: Actual tile size, with minor facial dimension as measured by ASTM C499, plus joint width indicated.
- B. Facial Dimension: Actual tile size, with minor facial dimension as measured by ASTM C499.
- C. Large Format Tile: Any tile unit that maintains an edge of 15 inches or greater in any dimension.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate location of tiling movement joints on concrete floor substrates with locations of concrete floor expansion and control joints; align substrate joints and tiling system joints where required by specified reference standards.
  - 2. Coordinate installation of drain components of shower receptor waterproofing system with Division 22.
- B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this Section; require attendance by Architect and all affected installers.
  - 1. Review installation procedures and coordination requirements.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- C. Verification Samples:
  - 1. Full-sized units of each type and composition of tile and for each color and finish specified. For ceramic mosaic tile in color blend patterns, provide one full sheet of each specified color blend.
  - 2. Full-sized units of each type of trim and accessory for each color and finish specified.
  - 3. Metal trim strips in 6 inch lengths for each profile required.
  - 4. Submit manufacturer's color samples of available grout consisting of actual sections of grout showing full range of colors available for each type of grout specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Installer's Qualification Statement:
  - 1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.

- F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Tile: 10 square feet of each size, color, and surface finish combination.

#### **1.06 QUALITY ASSURANCE**

- A. Installer Qualifications:
  - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
  - 2. Accredited Five-Star member of the National Tile Contractors Association (NTCA) or Trowel of Excellence member of the Tile Contractors' Association of America (TCAA).
- B. Provide materials obtained from only one manufacturer for each type and color of tile, and for each type of mortar, grout, adhesive, and sealant.

#### **1.07 MOCK-UPS**

- A. Mock-up: Construct tile mock-ups, incorporating all components for each specified tile product, including each specified metal trim type.
  - 1. Coordinate size and location of each mock-up with Architect.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

#### **1.09 FIELD CONDITIONS**

- A. Comply with referenced standards and manufacturer's recommendations for protection and maintenance of environmental conditions during and after installation.
- B. Do not install solvent-based products in an unventilated environment.
- C. Maintain ambient and substrate temperature of 50 degrees F during installation, and for at least seven days after installation. Maintain higher temperatures for proprietary mortars and grouts when recommended by manufacturer.
- D. Vent temporary heaters to the exterior to prevent damage to tile work due to carbon dioxide accumulation.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Manufacturers and products specified on Drawings.
  - 2. Acceptability of substituted items may be determined solely on the basis of design, appearance or finish.

#### **2.02 TRIM AND ACCESSORIES**

- A. Metal Trim: Satin natural anodized extruded aluminum, style, configuration, and dimensions to suit application, for setting using tile mortar or adhesive.
  - 1. Applications:
    - a. Open edges of floor tile.
    - b. Transition between floor finishes of different heights.
    - c. Floor to wall joints, where specified floor and wall tile do not have manufactured coved units, unless otherwise indicated on Drawings.
    - d. Borders and other trim as indicated on Drawings.
  - 2. Acceptable Manufacturer:
    - a. Schluter-Systems: [www.schluter.com/#sle](http://www.schluter.com/#sle).

#### **2.03 SETTING MATERIALS**

- A. Setting Materials - General:
  - 1. Use only the types of mortar bed materials to set the types of tile for which the mortar is labeled.

- B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
  - 1. Applications: For floor applications in new construction; high-bond Portland cement mortar.
    - a. Acceptable Products:
      - 1) Custom Building Products; MegaLite Crack Prevention Mortar, ProLite Tile & Stone Mortar, or Complete Contact Fortified Mortar.
      - 2) LATICRETE International, Inc.; 255 MultiMax or Sure Set.
      - 3) Mapei Corporation; Ultralite or Ultracontact.
  - 2. Applications: For wall applications; non-sagging, latex Portland cement mortar.
    - a. Acceptable Products:
      - 1) Custom Building Products; MegaLite or FlexBond Crack Prevention Mortar.
      - 2) LATICRETE International, Inc.; LATICRETE 254 Platinum.
      - 3) Mapei Corporation; Ultraflex 3.
- C. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.
  - 1. Acceptable Products:
    - a. Custom Building Products; Thick Bed/Medium Bed/VersaBond LFT.
    - b. LATICRETE International, Inc; LATICRETE 3701 Fortified Mortar Bed.
    - c. Mapei Corporation; Modified Mortar Bed: [www.mapei.com](http://www.mapei.com).

## 2.04 GROUTS

- A. Single Component Grout: Complies with performance criteria of ANSI A118.3, ANSI A118.6, and ANSI A118.7; polymer and inorganic component cement grout.
  - 1. Applications: Use this type of grout at all grout locations unless otherwise specified.
  - 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
  - 3. Prohibitions: Do not use grout sealers with this grout type.
  - 4. Color(s): As selected by Architect from manufacturer's full line.
  - 5. Acceptable Products:
    - a. Custom Building Products; Fusion Pro Single Component Grout: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
    - b. LATICRETE International, Inc.; SPECTRALOCK 1 Premium Grout: [www.laticrete.com](http://www.laticrete.com).
    - c. Mapei Corporation; Flexcolor CQ: [www.mapei.com](http://www.mapei.com).
- B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
  - 1. Applications: Use this type of grout at shower floor and wall applications, and other wet area locations indicated on Drawings.
  - 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
  - 3. Prohibitions: Do not use grout sealers with this grout type.
  - 4. Color(s): As selected by Architect from manufacturer's full line.
  - 5. Acceptable Products:
    - a. Custom Building Products; CEG-Lite 100% Solids Commercial Epoxy Grout: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
    - b. LATICRETE International, Inc.; LATICRETE SPECTRALOCK PRO Premium Grout: [www.laticrete.com](http://www.laticrete.com).
    - c. Mapei Corporation; Kerapoxy, Kerapoxy IEG, or Opticolor: [www.mapei.com](http://www.mapei.com).

## 2.05 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
  - 1. Crack Resistance: No failure at 1/8 inch gap, minimum.
  - 2. Fluid or Trowel Applied Type:
    - a. Thickness: 20 mils, maximum.
  - 3. Acceptable Products:
    - a. LATICRETE International, Inc.; LATICRETE FRACTURE BAN SC: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
    - b. Merkrete, by Parex USA, Inc; Merkrete Fracture Guard: [www.merkrete.com/#sle](http://www.merkrete.com/#sle).



- B. Waterproofing Membrane at Shower Floors and Walls: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
  - 1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
  - 2. Fluid or Trowel Applied Type:
    - a. Material: Synthetic rubber or Acrylic.
    - b. Thickness: 25 mils, minimum, dry film thickness.
  - 3. Acceptable Products:
    - a. Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
    - b. LATICRETE International, Inc; LATICRETE HYDRO BAN: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
    - c. Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 1: [www.merkrete.com/#sle](http://www.merkrete.com/#sle).
- C. Cleavage Membrane Under Thick Mortar Bed:
  - 1. Material: 4 mil thick polyethylene film, or as otherwise recommended by tile installer in accordance with requirements for specified unbonded mortar bed installation method.
- D. Reinforcing Mesh: 2 by 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that subfloor 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 subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
  - 1. Test in accordance with Section 090561.
  - 2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

#### **3.02 PREPARATION**

- A. Protect surrounding work from damage.
- B. Prepare floor substrates for installation of flooring in accordance with Section 090561.

#### **3.03 INSTALLATION - GENERAL**

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Blending: For tile exhibiting color or pattern variations within the ranges of accepted submittals, verify that tile has been blended in the packages so that tile units taken from one package show same range in colors or patterns as those taken from other packages. If not blended in the packages, blend tile in the field before installation.
- C. Floor System Coverage: Where specified for individual setting methods, install floor tile units with 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile units in referenced ANSI A108 specifications.
- D. Install crack isolation membrane to comply with ANSI A118.10 and membrane manufacturer's written instructions for full floor coverage.
- E. Movement Joints: Comply with TCNA (HB) Method EJ171F requirements for locations, spacing, and installation of applicable movement joints, whether or not specifically indicated or detailed on Drawings, and as follows:
  - 1. Spacing - Interior: Maximum 24 feet on center in each direction; reduce spacing to maximum 10 feet on center in areas exposed to direct sunlight or moisture.
  - 2. Spacing - Above-Ground Concrete Slabs: Maximum 10 feet on center in each direction.

3. Joint Width: Match adjacent grouted joint widths, unless TCNA EJ171 requires a specific joint width based on joint location or joint service conditions.
  4. Apply sealant joint to junction of tile and dissimilar materials and junction of dissimilar planes, including but not limited to floor to wall joints, corners, and metal trim and non-ceramic accessory items.
  5. Keep movement joints free of setting adhesive and grout.
  6. Form internal angles and corners square, not grouted, with sealant joint.
  7. Form external angles and corners square, not grouted, with sealant joint.
  8. Apply specified sealant to joints.
- F. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- G. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly.
1. Where floor and wall tile are of same dimensional module, align floor and wall joints.
- H. 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.
- I. Install non-ceramic trim in accordance with manufacturer's instructions.
- J. Sound tile after setting. Remove and replace hollow sounding units.
- K. Keep control and expansion joints free of mortar, grout, and adhesive.
- L. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- M. Grout tile joints, except where movement joints are indicated or specified.
- N. 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.
- O. Allow completed tiling assemblies to cure full 72 hours before allowing heavy foot or equipment traffic on final installations.
- P. Seal joints between tile work and other work with sealant specified in Section 079200.
- Q. Remove tiling installations that do not conform to specified requirements and tolerances, particularly lippage tolerances, and re-install in compliance with specified requirements.

#### **3.04 INSTALLATION - FLOORS - THIN-SET METHODS**

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F125, latex-Portland cement bond coat.
1. Grout Type: Epoxy grout.
  2. Provide 100 percent coverage of setting mortar over tile back surfaces.
  3. Use crack isolation membrane under all tile meeting or exceeding definition of large format tile units in nominal face dimension, and also where specified.

#### **3.05 INSTALLATION - FLOORS - MORTAR BED METHODS**

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F121, unbonded.
1. Grout Type: Single-component grout.

#### **3.06 INSTALLATION - SHOWER STALLS**

- A. At shower stalls install in accordance with TCNA (HB) Method B422C over cementitious backer units with waterproofing membrane, or Method W211 mortar bed over concrete masonry, as indicated on Drawings.
1. Shower Stalls: Walls within showering area and adjacent to changing vestibules; see Drawings for additional location information.
  2. Grout Type: Epoxy grout.

#### **3.07 INSTALLATION - WALL TILE**

- A. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.
1. Grout Type: Single-component grout or epoxy grout; see Drawings for differing locations of each type.

- B. Over interior concrete and masonry install in accordance with TCNA (HB) Method W211, bonded mortar bed without membrane.
  - 1. Grout Type: Single-component grout or epoxy grout; see Drawings for differing locations of each type.

### **3.08 TOLERANCES**

- A. Comply with applicable requirements of ANSI A108.2, unless otherwise specified in this Section.
- B. Flatness - Finished Tiling Surfaces:
  - 1. Ceramic Tile: 1/4 inch in 10 feet.
  - 2. Stone Tile: 1/8 inch in 10 feet.
- C. Lippage - Adjacent Tile Units:
  - 1. Glazed Wall Tile and Mosaic Tile: 1/32 inch; joint width 1/16 inch to 1/8 inch; 1 x 1 inch to 6 x 6 inch tile size.
  - 2. Pressed Floor Tile and Porcelain Tile: 1/32 inch; joint width 1/16 inch to less than 1/4 inch; all tile sizes.
  - 3. Pressed Floor Tile and Porcelain Tile: 1/16 inch; joint width greater than 1/4 inch; all tile sizes.

### **3.09 CLEANING**

- A. Clean tile and grout surfaces.
- B. Unglazed tile may be cleaned with sulfamic acid solutions only when permitted by the tile and grout manufacturer's printed instructions, but not sooner than period of time after completion of installation in accordance with manufacturer's recommendations. Protect metal surfaces, iron, and vitreous fixtures from effects of acid cleaning. Flush surfaces with clean water before and after acid cleaning.
- C. Leave finished installation clean and free of cracked, chipped, broken, un-bonded, or otherwise defective tile work.

### **3.10 PROTECTION**

- A. Do not permit traffic over finished floor surface for minimum 7 days after installation.

**END OF SECTION**

**SECTION 095100**  
**ACOUSTICAL CEILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Acoustical ceiling systems, including:
  - 1. Suspended metal grid ceiling system.
  - 2. Acoustical units.
  - 3. Supplementary insulation above ceiling.

**1.02 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.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- E. 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.
- F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the location of hangers with other work.
- B. Sequencing: 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.
  - 1. Do not install acoustical units until after interior wet work is dry.

**1.04 SUBMITTALS**

- A. Product Data: Provide data on suspension system components and acoustical units.
- B. Samples: Submit two samples minimum 6 by 6 inch in size illustrating material and finish of acoustical units.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Acoustical Units: 80 sq ft of each type and size.

**1.05 QUALITY ASSURANCE**

- A. System Installer Qualifications: Company specializing in the installation of products specified in this Section with minimum three years documented experience.

**1.06 FIELD CONDITIONS**

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 20 to 40 percent prior to, during, and after acoustical unit installation.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acceptable Manufacturers - Acoustic Panels:
  - 1. Manufacturers and ceiling panel products specified in this Section.
  - 2. Acceptability of substituted items may be determined solely on the basis of design, appearance or finish.
- B. Acceptable Manufacturers - Suspension Systems:
  - 1. Same as for acoustical units.

## 2.02 ACOUSTICAL CEILINGS

- A. Acoustical Units - General: ASTM E1264, Class A.

## 2.03 CEILING PANEL MATERIALS

- A. Acoustical Panels, Type C-1: Glass fiber with membrane-faced overlay, with the following characteristics:
1. Classification: ASTM E1264 Type XII.
    - a. Form: 2, cloth.
    - b. Pattern: "E" - lightly textured.
  2. Size: As indicated on Drawings.
  3. Thickness: 3/4 inch.
  4. Light Reflectance: 90 percent, determined in accordance with ASTM E1264.
  5. NRC Range: 0.90 to 1.00, determined in accordance with ASTM E1264.
  6. Articulation Class (AC): 180 to 200, determined in accordance with ASTM E1264.
  7. Panel Edge: Square tegular.
  8. Color: White.
  9. Suspension System: Exposed grid; Type 1.
  10. Basis of Design Product:
    - a. Armstrong World Industries, Inc.; Optima: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).
- B. Acoustical Panels, Type C-3: Vinyl-faced glass fiber, with the following characteristics:
1. Classification: ASTM E1264 Type XX.
    - a. Pattern: "G" - smooth.
  2. Size: As indicated on Drawings.
  3. Thickness: 5/8 inches
  4. Light Reflectance: 82 percent, determined in accordance with ASTM E1264.
  5. NRC Range: 0.50 to 0.60, determined in accordance with ASTM E1264.
  6. Ceiling Attenuation Class (CAC): 40, determined in accordance with ASTM E1264.
  7. Panel Edge: Square.
  8. Color: White.
  9. Suspension System: Exposed grid; Type 2.
  10. Basis of Design Product:
    - a. Armstrong World Industries, Inc.; Ceramagard: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.

## 2.04 SUSPENSION SYSTEMS

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
1. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
  2. Aluminum Grid: Aluminum sheet, ASTM B209/B209M.
  3. Finish: Manufacturer's standard, unless otherwise specified for grid type and location.
- B. Exposed Suspension System, Type 1: Hot-dip galvanized steel grid and cap.
1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
  2. Profile: Tee; 9/16 inch face width.
  3. Finish: Baked enamel.
    - a. High-Humidity Finish: Manufacturer's standard finish classified for severe environmental performance.
  4. Color: White.
- C. Exposed Suspension System, Type 2: Aluminum grid and cap.
1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
  2. Profile: Tee; 15/16 inch face width.
  3. Finish: Baked enamel.
    - a. High-Humidity Finish: Manufacturer's standard finish classified for severe environmental performance.
  4. Color: White, unless specified as "black" color.

## 2.05 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: Minimum 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Perimeter Trim Profiles: Same material and finish as grid.
  - 1. Size: As required for installation conditions.
  - 2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
- E. 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 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

### 3.03 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 plan.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  - 1. Install in bed of acoustical sealant.
  - 2. Use longest practical lengths.
  - 3. Overlap and rivet corners.
- E. Suspension System: 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.
  - 1. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.
- 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 of each corner, or support components independently.
  - 1. Support all fixtures weighing less than 56 lb by at least two supplementary No. 12 gage hangers if required by applicable building code; hangers may be slack.
- I. Do not eccentrically load system or induce rotation of runners.

### 3.04 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 shortest room axis, unless otherwise indicated or directed.

- D. Fit border trim neatly against abutting surfaces.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
  - 1. Cut to fit irregular grid and perimeter edge trim.
  - 2. Make field cut edges of same profile as factory edges; finish cut edges to match factory finished edges if cut edge is exposed to view.
- G. Install hold-down clips on panels within 20 ft of an exterior door.

**3.05 TOLERANCES**

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

**3.06 CLEANING**

- A. Clean surfaces.
- B. Replace damaged or abraded components.

**END OF SECTION**

**SECTION 096500  
RESILIENT FLOORING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Resilient flooring, including vinyl tile flooring (VTF).
- B. Flooring system accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 090561 - Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Sequencing:
  - 1. Install resilient flooring and accessories after other finishing operations, including painting have been completed.
  - 2. Do not install resilient flooring over concrete slabs until slabs have been fully cured, and are sufficiently dry to achieve proper bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

**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 for sheet flooring products.
- C. Verification Samples: Submit two samples, minimum 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.
- D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor 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: 50 square feet of each type and color.
  - 2. Clearly identify each package.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

**1.06 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. Deliver and store materials in manufacturer's original unopened containers, with brand names and production lot numbers clearly marked.
- C. Store all materials off of the floor in an acclimatized, weather-tight space until ready for installation. Maintain storage space within lower and upper temperature and humidity limits required by flooring manufacturer
- D. Store materials for not less than 48 hours prior to installation in area of installation at a minimum temperature of 65 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F and not exceeding 85 degrees F, unless otherwise restricted by flooring manufacturer. Maintain temperature and relative humidity at the same levels during installation, and after installation.



### 1.07 WARRANTY

- A. Resilient Flooring: Provide manufacturer's warranty, as follows:
  - 1. Materials: Minimum 2 years from date of Substantial Completion.
  - 2. Installation: Minimum 2 years from date of Substantial Completion; warrant entire installation against loss of adhesion to substrates.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Manufacturers and products specified on Drawings.
  - 2. Acceptability of substituted items may be determined solely on the basis of design, appearance or finish.

### 2.02 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Metal Edge Trim: Satin natural anodized extruded aluminum, style, configuration, and dimensions to suit application, for setting using adhesive.
  - 1. Applications: Provide metal edge trim for the following applications, unless otherwise noted on Drawings.
    - a. Open edges of flooring.
    - b. Transition between floor finishes of different heights.
    - c. Thresholds at door openings.
    - d. Borders and other trim as indicated on Drawings.
  - 2. Acceptable Manufacturers:
    - a. Schluter-Systems: [www.schluter.com/#sle](http://www.schluter.com/#sle).
- D. Resilient Edge Strips: Homogeneous vinyl or rubber type; tapered or bullnose edge; one inch wide; color as scheduled on Drawings.
- E. Linoleum Flooring Accessories: Provide flooring manufacturer's required installation accessories, including but not limited to welding rod, joint fillers and sealers, for complete installation in accordance with flooring manufacturer's requirements.

## 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 Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
  - 1. Test in accordance with Section 090561.
  - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

### 3.02 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 090561.

### 3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.

- C. Adhesive-Applied Installation:
  - 1. Spread only enough adhesive to permit installation of materials before initial set.
  - 2. Fit joints and butt seams tightly.
  - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
  - 1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws or adhesive.
  - 2. Resilient Strips: Attach to substrate using adhesive.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- G. Install flooring in recessed floor access covers where indicated, maintaining floor pattern.
- H. 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. Seams are prohibited in bathrooms, kitchens, toilet rooms, and custodial closets.
- C. Cut sheet at seams in accordance with manufacturer's instructions.
- D. Seal seams by heat welding where indicated or required by manufacturer for applicable flooring products.
- E. Chemically bond seams using seam sealer where indicated or required by manufacturer for applicable flooring products.

#### **3.05 INSTALLATION - TILE AND PLANK 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 square tile to patterns as indicated on Drawings.
- D. Install plank tile to patterns as indicated on Drawings.

#### **3.06 CLEANING**

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

#### **3.07 PROTECTION**

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

**END OF SECTION**

**SECTION 096513**  
**RESILIENT WALL BASE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Resilient wall base.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Sequencing: Install resilient wall base and accessories after other finishing operations, including painting have been completed.

**1.03 REFERENCE STANDARDS**

- A. ASTM F1861 - Standard Specification for Resilient Wall Base.

**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. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

**1.06 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. Deliver and store materials in manufacturer's original unopened containers, with brand names and production lot numbers clearly marked.
- C. Store all materials off of the floor in an acclimatized, weather-tight space until ready for installation. Maintain storage space within lower and upper temperature and humidity limits required by flooring manufacturer
- D. Store materials for not less than 48 hours prior to installation in area of installation at a minimum temperature of 65 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F and not exceeding 85 degrees F, unless otherwise restricted by flooring manufacturer. Maintain temperature and relative humidity at the same levels during installation, and after installation.
  - 1. Protect roll materials from damage by storing on end.
  - 2. Do not double stack pallets.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Manufacturers and products specified on Drawings.
  - 2. Acceptability of substituted items may be determined solely on the basis of design, appearance or finish.

**2.02 RESILIENT BASE**

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; Style B, Cove, unless otherwise indicated on Drawings.
  - 1. Height: 4 inch.
  - 2. Thickness: 0.125 inch.
  - 3. Length: Roll.
  - 4. Color: As scheduled on Drawings.

**2.03 ACCESSORIES**

- A. Adhesives: Waterproof; types recommended by manufacturer for specified products and indicated substrate conditions.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. 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.

**3.02 PREPARATION**

- A. Clean wall substrates.

**3.03 INSTALLATION - RESILIENT BASE**

- A. Fit joints tightly and make vertical. Install in longest lengths possible; maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

**3.04 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 096813**  
**TILE CARPETING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Carpet tile, fully adhered.

**1.02 REFERENCE STANDARDS**

- A. CRI 104 - Standard for Installation of Commercial Carpet.

**1.03 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 and perimeter conditions requiring special attention.
- D. Operation and 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. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver carpeting materials in original mill protective wrapping, with mill register numbers and tags attached.
- B. Store inside, in well ventilated area, protected from weather, moisture, and soiling.

**1.06 FIELD CONDITIONS**

- A. Stage materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Ventilate installation area during installation and for 72 hours after installation.
- D. Do not commence with carpet installation until painting and finishing work is complete and ceilings and overhead work has been tested, approved, and completed.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Manufacturers and products specified on Drawings.
  - 2. Substitutions: Acceptability of substituted items may be determined solely on the basis of design, appearance or finish.

**2.02 ACCESSORIES**

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Metal Edge Trim: Satin natural anodized extruded aluminum, style, configuration, and dimensions to suit application, for setting using tile mortar or adhesive.
  - 1. Applications:
    - a. Open edges of tile carpeting.
    - b. Transition between floor finishes of different heights.
  - 2. Acceptable Manufacturers:
    - a. Blanke Corporation: [www.blankecorp.com/#sle](http://www.blankecorp.com/#sle).
    - b. Futura Industries Corp./Futura Transitions: [www.futuratransitions.com](http://www.futuratransitions.com).

- c. Genesis APS International: [www.genesis-aps.com/#sle](http://www.genesis-aps.com/#sle).
  - d. LATICRETE International, Inc.: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
  - e. Schluter-Systems: [www.schluter.com/#sle](http://www.schluter.com/#sle).
- C. Resilient Wall Base: Specified in Section 096500.
  - D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.
  - E. Miscellaneous Materials: Provide other items recommended by carpet manufacturer and installer for the indicated conditions of carpet use, and as required for complete installation.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
  - 1. Test in accordance with Section 090561.
  - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

#### **3.02 PREPARATION**

#### **3.03 INSTALLATION**

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).
- 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 indicated pattern, with pile direction alternating to next unit, set parallel to building lines unless otherwise indicated on Drawings.
- 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. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
  - 1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.

#### **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 098430**  
**ACOUSTICAL WALL AND CEILING UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Acoustical wall and ceiling units, including:
  - 1. Acoustical ceiling baffles (Ceiling Type C-2).
  - 2. Mounting accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's printed data sheets for products specified.
- B. Shop Drawings: Fabrication and installation details and panel layout.
- C. Samples: Submit two samples of each type of panel specified; minimum 6 by 6 inch in size, illustrating material, finish, construction, and edge details.
- D. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Acceptable to the manufacturer of the acoustical products being installed.
- B. Basis of Design: Specifications are based on acoustical accessory types by specified basis of design manufacturer. Acoustical accessory types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, weight, profile, and performance are minor, and do not detract substantially from the indicated design intent.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

**1.06 MOCK-UPS**

- A. Construct mock-up of acoustical units at location as indicated by Architect.
  - 1. Do not proceed with remaining work until Architect approves workmanship and appearance.
  - 2. Mock-up may remain as part of work.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. As specified in this Section for each product.
  - 2. Substitutions: Not permitted.
- B. Provide all acoustical products of each type specified herein or on Drawings by same manufacturer.

**2.02 ACOUSTICAL UNITS - GENERAL**

- A. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Acoustical Absorption: Perform testing in accordance with ASTM C423, Type A mounting method unless otherwise indicated or specified.

### **2.03 FABRIC-COVERED SOUND-ABSORBING UNITS**

- A. Acoustical Baffles: 100 percent acoustic PET panels.
  - 1. Thickness: 3 inch.
  - 2. Height: 10 inch.
  - 3. Lengths: As indicated on Drawings.
  - 4. Edges: Manufacturer's standard.
  - 5. Colors: As selected from manufacturer's standards.
  - 6. Mounting: Manufacturer's standard for each indicated application.
  - 7. Acceptable Manufacturer:
    - a. kirei; O Baffles: [www.kireiusa.com](http://www.kireiusa.com).
    - b. Substitutions: See Section 016000 - Product Requirements.

### **2.04 FABRICATION**

- A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

### **2.05 ACCESSORIES**

- A. Ceiling-Suspended Accessories: Manufacturer's standard accessories at locations as indicated on each acoustical unit, sized appropriately for weight of acoustical unit.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates for conditions detrimental to installation of acoustical baffles. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION**

- A. General: Install acoustical baffles in locations as indicated, following manufacturer's installation instructions.
- B. Install mounting accessories and supports in accordance with shop drawings.
- C. Align baffles accurately, with edges plumb and top edges level.
- D. Install acoustical baffles to construction tolerances of plus or minus 1/16 inch for the following:
  - 1. Plumb and level.
  - 2. Flatness.
  - 3. Width of joints.

### **3.03 CLEANING**

- A. Clean baffles upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

### **3.04 PROTECTION**

- A. Provide protection of installed acoustical baffles until Date of Substantial Completion.
- B. Replace baffles that cannot be cleaned and repaired to satisfaction of the Architect.

**END OF SECTION**



**SECTION 099123**  
**INTERIOR PAINTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.

**1.02 RELATED REQUIREMENTS**

- A. Section 099600 - High-Performance Coatings.

**1.03 DEFINITIONS**

- A. Comply with ASTM D16 for interpretation of terms used in this section.
- B. Gloss Ratings: ASTM D523; on 60 and 85 degree gloss meters:
  - 1. MPI Gloss Level 1 (Flat): Not more than five units at 60 degrees and 10 units at 85 degrees.
  - 2. MPI Gloss Level 2 (Velvet): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees.
  - 3. MPI Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
  - 4. MPI Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees.
  - 5. MPI Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees.
  - 6. MPI Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees.
  - 7. MPI Gloss Level 7 (High Gloss): More than 85 units at 60 degrees.

**1.04 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating.
- D. ASTM D523 - Standard Test Method for Specular Gloss.
- E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- F. SSPC-SP 13 - Surface Preparation of Concrete.

**1.05 SUBMITTALS**

- A. 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 products to be used in project; include description of each system.
  - 3. Manufacturer's installation instructions.
- B. Samples: Submit two painted samples, illustrating selected colors for each color and system selected with specified coats cascaded. Submit on tempered hardboard, 8 x 10 inch in size.
- C. Shop Drawings: Indicate layout and colors of gymnasium and other game line floor striping.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Paint and Finish Materials: 1 gal of each color and finish; from the same product run, store where directed.
  - 2. Label each container with color in addition to the manufacturer's label.

**1.06 QUALITY ASSURANCE**

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

- B. Basis of Design: Specifications are based on paint types and systems by specified basis of design manufacturer. Paint types and systems manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in formulation, compatibility, and performance are minor, and do not detract substantially from the indicated design intent.

#### **1.07 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 and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

#### **1.08 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 above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Basis of Design Manufacturer:
  - 1. Sherwin-Williams Company: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
- C. Other Acceptable Manufacturers:
  - 1. Benjamin Moore & Co.: [www.benjaminmoore.com](http://www.benjaminmoore.com).
  - 2. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
- D. Acceptable Manufacturers - Primer Sealers: Same manufacturer as top coats; no exceptions.

#### **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:
  - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. Architectural coatings VOC limits of California.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- 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: As scheduled on Drawings.

### 2.03 PAINT SYSTEMS

- A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board and concrete masonry units.
  1. See Section 09 9600 for additional interior painting requirements.
  2. Two top coats and one coat primer.
  3. Top Coat(s): High Performance Architectural Interior Latex; Scuff-Resistant Gypsum Board Surfaces.
    - a. Acceptable Products:
      - 1) Sherwin-Williams Scuff Tuff Interior Waterbased Enamel, Eg-Shel, S24-150 Series.
      - 2) Sherwin-Williams Scuff Tuff Interior Waterbased Enamel, Semi-Gloss, S26-150 Series.
  4. Top Coat(s): Institutional Low Odor/VOC Interior Latex; Gypsum Board Surfaces, unless otherwise specified or scheduled on Drawings.
    - a. Acceptable Products:
      - 1) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Eggshell, B20-2600 Series.
      - 2) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss.
  5. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including primed metals, unless otherwise specified in Section 09 9600:
  1. See Section 09 9600 for additional interior painting requirements.
  2. Medium duty applications include steel doors, door frames, railings, handrails, and guardrails.
  3. Two top coats over shop primer.
  4. Top Coat(s): Interior Light Industrial Coating, Water Based.
    - a. Acceptable Product:
      - 1) Sherwin-Williams Pro Industrial Acrylic Coating, Semi-Gloss. (MPI #153)
  5. Primer: As recommended by top coat manufacturer for specific substrate.

### 2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
  1. Refer to Section 09 9600 for block filler at wet locations.
  2. Latex Block Filler: One heavy coat squeegeed into pores.
    - a. Acceptable Product:
      - 1) Sherwin-Williams Loxon Block Surfacer. (MPI #4)

### 2.05 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 adequately 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 affect 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 is below the following maximums:
  - 1. Gypsum Wallboard: 12 percent.
  - 2. 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 or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
  - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
  - 2. Clean concrete according to ASTM D4258. Allow to dry.
  - 3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- F. Masonry:
  - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, 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. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

### **3.03 APPLICATION**

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. 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 finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

**END OF SECTION**

**SECTION 099300**  
**STAINING AND TRANSPARENT FINISHING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Field application of stains.
- B. Field application of transparent finishes.

**1.02 DEFINITIONS**

- A. Comply with ASTM D16 for interpretation of terms used in this Section.
- B. Gloss Ratings: ASTM D523; on 60 and 85 degree gloss meters:
  - 1. MPI Gloss Level 1 (Flat): Not more than five units at 60 degrees and 10 units at 85 degrees.
  - 2. MPI Gloss Level 2 (Velvet): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees.
  - 3. MPI Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
  - 4. MPI Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees.
  - 5. MPI Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees.
  - 6. MPI Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees.
  - 7. MPI Gloss Level 7 (High Gloss): More than 85 units at 60 degrees.

**1.03 REFERENCE STANDARDS**

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.
- C. ASTM D523 - Standard Test Method for Specular Gloss.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

**1.04 SUBMITTALS**

- A. Product Data: Provide complete list of products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and catalog number, and general product category.
  - 2. Manufacturer's application instructions.
- B. Maintenance Data: Submit data including finish schedule showing where each product, color, and finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Stock Materials: Stain and transparent finish materials, 1 gal of each color and type; store where directed.
  - 2. Label each container with color and type in addition to the manufacturer's label.

**1.05 QUALITY ASSURANCE**

- A. Applicator Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- B. Basis of Design: Specifications are based on stain and finishing types and systems by specified basis of design manufacturer. Stain and finishing types and systems manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in formulation, compatibility, and performance are minor, and do not detract substantially from the indicated design intent.

**1.06 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 stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Finish Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

### 1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.
- 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 above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperature: 50 degrees F unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc measured mid-height at substrate surface during application of finishes.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Provide finishes used in any individual system from the same manufacturer; no exceptions.
- B. Basis of Design Manufacturer:
  - 1. Sherwin-Williams Company: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
- C. Other Acceptable Manufacturers:
  - 1. Behr Process Corporation: [www.behr.com/#sle](http://www.behr.com/#sle).
  - 2. Benjamin Moore & Co.: [www.benjaminmoore.com](http://www.benjaminmoore.com).
  - 3. Diamond Vogel Paints: [www.diamondvogel.com/#sle](http://www.diamondvogel.com/#sle).
  - 4. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).

### 2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

- A. Finishes:
  - 1. Provide finishes 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 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 finish material in quantity required to complete entire project's work from a single production run.
  - 4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Flammability: Comply with applicable code for surface burning characteristics.
- 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.

### 2.03 EXTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

- A. Finish on Wood Soffits:
  - 1. Stain: Exterior Semi-Transparent Stain for Wood, Water Based.
    - a. Two coats stain.
    - b. Acceptable Product:
      - 1) Sherwin-Williams DeckScapes Exterior Waterborne Toner Stain; A18C50500.
  - 2. Top Coat: Two coats waterborne finish.
    - a. Gloss: Satin.
    - b. Acceptable Product:
      - 1) Sherwin-Williams DeckScapes Exterior Waterborne Clear; SD1T100.

### 2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.
- B. Fastener Head Cover Material: Latex filler.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Do not begin application of stains 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. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- 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. Wood: 15 percent, measured in accordance with ASTM D4442.

#### **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 or finishing.
- D. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

#### **3.03 APPLICATION**

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- F. Reinstall items 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 finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

**END OF SECTION**

**SECTION 099600**  
**HIGH-PERFORMANCE COATINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. High performance coatings.
- B. Surface preparation.
- C. Post-occupancy inspection requirements.

**1.02 DEFINITIONS**

- A. Dry Film Thickness (DFT): Thickness of one coat of paint fully cured, measured in mils (1/1000 inch).
- B. Gloss Ratings: ASTM D523; on 60 and 85 degree gloss meters:
  - 1. MPI Gloss Level 1 (Flat): Not more than five units at 60 degrees and 10 units at 85 degrees.
  - 2. MPI Gloss Level 2 (Velvet): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees.
  - 3. MPI Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
  - 4. MPI Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees.
  - 5. MPI Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees.
  - 6. MPI Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees.
  - 7. MPI Gloss Level 7 (High Gloss): More than 85 units at 60 degrees.

**1.03 REFERENCE STANDARDS**

- A. ASTM D1653 - Standard Test Methods for Water Vapor Transmission of Organic Coating Films.
- B. ASTM D523 - Standard Test Method for Specular Gloss.
- C. ASTM G85 - Standard Practice for Modified Salt Spray (Fog) Testing.
- D. ICRI CSP-3 - International Concrete Repair Institute; Concrete Surface Repair Level 3.
- E. SSPC-SP 16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.
- F. SSPC-SP 6 - Commercial Blast Cleaning.
- G. SSPC-SP 13 - Surface Preparation of Concrete.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate work with concrete floor placement and concrete curing, for compatibility of substrates.
  - 2. Coordinate work with priming of steel products to receive coatings, for compatibility of primed substrates.
- B. Preinstallation Meeting: Convene one week before starting work of this Section. Require attendance by all relevant installers.
  - 1. Review the following:
    - a. Environmental requirements.
    - b. Protection of surfaces not scheduled to be coated.
    - c. Surface preparation.
    - d. Application methods and procedures.
    - e. Repair methods and procedures.
    - f. Field quality control.
    - g. Cleaning methods and procedures.
    - h. Protection of coating systems.
    - i. One year inspection requirements.

**1.05 SUBMITTALS**

- A. Product Data: Provide complete list of all 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. "epoxy").



2. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
  3. Manufacturer's installation instructions.
- B. Samples: Submit two sets of samples 6 x 6 inch in size, illustrating colors available for selection.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Data: Include cleaning procedures and repair and patching techniques.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. Extra Coating Materials: 1 gallon of each type and color.
  2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

#### **1.06 QUALITY ASSURANCE**

- A. Applicator Qualifications: Company specializing in performing the work of this Section with minimum five years documented experience.
- B. Basis of Design: Specifications are based on coating types by specified basis of design manufacturer and products. Coating types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in formulation and performance are minor, and do not detract substantially from the indicated design intent.

#### **1.07 MOCK-UPS**

- A. Mock-up: Provide mock-up of typical beam, joist and steel decking condition, 20 feet long by 20 feet wide, illustrating coatings, for each specified coating.
1. Locate where directed.
  2. Mock-up may remain as part of the work.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in manufacturer's original, unopened containers and packaging, with labels clearly identifying:
1. Coating or material name.
  2. Manufacturer.
  3. Color name and number.
  4. Date of manufacture.
  5. Batch or lot number.
  6. Mixing and thinning instructions.
- B. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions.
1. Keep containers sealed until ready for use.
  2. Do not use materials beyond manufacturer's shelf life limits.
- C. Protect materials during handling and application to prevent damage or contamination.

#### **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Weather:
1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.
  2. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point.
  3. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.
  4. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.
  5. Wind: Do not spray coatings if wind velocity is above manufacturer's limit.
- B. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.

- C. Dust and Contaminants:
  - 1. Schedule coating work to avoid excessive dust and airborne contaminants.
  - 2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

#### 1.10 FIELD CONDITIONS

- A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- B. Maintain required temperature range 24 hours before, during, and 72 hours after installation of coating.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.
- D. Restrict traffic from area where coating is being applied or is curing.

#### 1.11 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for bond to substrate.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Basis of Design Manufacturer:
  - 1. Tnemec Company, Inc.: [www.tnemec.com/#sle](http://www.tnemec.com/#sle).
    - a. Paint Systems: As specified in this Section for each application.
    - b. Representative Contact: Steve Williamson; 303-431-7334; [swilliamson@tnemec.com](mailto:swilliamson@tnemec.com).
- B. Other Acceptable Manufacturers:
  - 1. Carboline Company: [www.carboline.com](http://www.carboline.com).

#### 2.02 HIGH PERFORMANCE COATING SYSTEMS

- A. Coatings Systems - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
  - 1. Lead Content: Not greater than 0.06 percent by weight of total nonvolatile content.
  - 2. Chromium Content: As hexavalent chromium, zinc chromate, or strontium chromate; none.
  - 3. Low Temperature Applications: When high performance coatings must be applied in ambient or substrate temperatures below manufacturers recommendations or as specified for environmental requirements in this Section, use manufacturer's special low-temperature formulations designed specifically for application to substrates at required application temperatures (ie., Tnemec L69F, etc.).
  - 4. Colors: Selected from manufacturer's standard colors.
- B. Acceptable Alternate Product for Lower Ambient Temperature Conditions: Tnemec L69F in place of L69 in any of the high-performance coating systems specified in this Section.
  - 1. Confirm acceptability of this alternative with Architect before preparation of applicable submittals for approval.
- C. High-Performance Coating - Type 1A: Epoxy-polyamidoamine intermediate coats with hybrid polyurethane finish system, satin sheen finish.
  - 1. Exterior Applications: Exposed galvanized and non-galvanized steel, including previously primed steel, hollow metal doors and frames, and other locations noted on Drawings.
  - 2. Factory Base Primers: Specified in Sections 05 1200, 05 2100, and 08 1113.
  - 3. Surface Preparation:
    - a. Non-Galvanized Steel: Prepare surfaces according to SSPC-SP 6; apply one shop coat of Tnemec 94-H20 or Tnemec 90-97 Tneme-Zinc at 2.5 to 3.5 mils DFT.
    - b. Galvanized Steel: Prepare surfaces according to SSPC-SP 16; apply one shop coat of Tnemec L69/N69-1255 HBE II at 2.0 to 3.0 mils DFT.
  - 4. Field Primer Coat: Tnemec L69-1255 HBE II at 3.0 to 5.0 mils DFT.
  - 5. Field Finish Coat: Tnemec Series 690 Siloxilon at 2.0 to 3.0 mils DFT.

6. Total System Thickness (including primer coats): 7.0 to 11.5 mils DFT.
  7. Perm Rating: 0.23 perms measured in accordance with ASTM D1653.
  8. Prohesion Testing: In accordance with ASTM G85.
- D. High-Performance Coating - Type 2A: Epoxy-polyamidoamine finish system, satin sheen finish.
1. Interior Applications: Non-galvanized structural steel and steel joists, metal fabrications, hollow metal doors, frames and windows, and other locations noted on Drawings.
  2. Factory Base Primer: Specified in Sections 05 1200 and 05 2100.
  3. Surface Preparation:
    - a. Non-Galvanized Steel: Prepare surfaces according to SSPC-SP 6; apply one shop coat of Tnemec 94-H20 or Tnemec 90-97 Tneme-Zinc at 2.5 to 3.5 mils DFT.
  4. First Coat: Tnemec L69-Color HBE II at 4.0 mils DFT.
  5. Field Finish Coat: Tnemec L69-Color HBE II at 4.0 mils DFT.
  6. Total System Thickness (including primer coats): 10.5 to 11.5 mils DFT.
  7. Perm Rating: 0.23 perms measured in accordance with ASTM D1653.
  8. Prohesion Testing: In accordance with ASTM G85.
- E. High-Performance Coating - Type 3A: Epoxy-polyamidoamine finish system, satin sheen finish.
1. Interior Applications: Galvanized steel decking, structural steel, metal fabrications, and other locations noted on Drawings.
  2. Factory Base Primer: Specified in Sections 05 1200, 05 2100, and 05 3100; see Section 05 3100 for priming options:
    - a. If Option 1 is selected, no intermediate coat (primer) is required, and prepare surfaces according to SSPC-SP 16 as specified in this Section.
    - b. If Option 2 is selected, provide factory primer as specified in Section 05 3100, and provide adhesion approval of high performance coating manufacturer prior to application of high performance finish coating system specified in this Section.
  3. Surface Preparation:
    - a. Shop Preparation: Remove visible deposits of oil, grease, or other contaminants according to SSPC-SP 1.
    - b. Repair welds, burned, and damaged areas; spot prime with Tnemec Series 1 Omnithane.
    - c. Galvanized Steel: Prepare surfaces according to SSPC-SP 16 to achieve uniform anchor profile of 1.0 to 2.0 mils; prepared surfaces must be clean, dry, and contaminant-free prior to application of field-applied finish coats.
  4. First Coat (Shop-Primed Off-Site): Tnemec L69-Color HBE II at 2.0 to 3.0 mils DFT.
  5. Field Finish Coat: Tnemec L69-Color HBE II at 2.0 to 3.0 mils DFT.
  6. Total System Thickness (including primer coats): 5.0 to 8.0 mils DFT.
  7. Perm Rating: 0.23 perms measured in accordance with ASTM D1653.
  8. Prohesion Testing: In accordance with ASTM G85.
- F. High-Performance Coating - Type 4: Not Used.
- G. High-Performance Coating - Type 5A (Cementitious Acrylic Block Filler): Epoxy-polyamidoamine finish system, satin sheen finish.
1. Interior Applications: Concrete masonry units, and other locations noted on Drawings.
  2. Surface Preparation: Level all fins and protrusions.
    - a. Block Filler: Apply one complete application of Tnemec Series 130 Envirofill at 80 to 100 sq ft per gallon (approximately 20 mils DFT). Prepared surfaces must be clean, dry, and contaminant-free prior to application of field-applied finish coats.
  3. First Coat: Tnemec L69-Color HBE II at 150 to 200 sq ft per gallon (4.0 to 6.0 mils DFT).
    - a. Color: Contrasting color.
  4. Field Finish Coat: Tnemec L69-Color HBE II at 150 to 200 sq ft per gallon (4.0 to 6.0 mils DFT).
  5. Total System Thickness (including primer coats): 28.0 to 32.0 mils DFT.
  6. Perm Rating: 0.23 perms measured in accordance with ASTM D1653.
  7. Prohesion Testing: In accordance with ASTM G85.

- H. High-Performance Coating - Type 6: Water-borne epoxy primer and epoxy-polyamidoamine finish system, satin sheen finish.
  - 1. Interior Applications: Glass mat-faced gypsum board, and other locations noted on Drawings.
  - 2. Surface Preparation: Prepared surfaces must be clean, dry, and contaminant-free prior to application of field-applied finish coats.
  - 3. Primer: Tnemec Series 151-1051 Elasto-Grip at 200 to 400 sq ft per gallon (0.7 to 1.5 mils DFT).
  - 4. First Coat: Tnemec L69-Color HBE II at 200 to 250 sq ft per gallon (3.0 to 6.0 mils DFT).
    - a. Color: Contrasting color.
  - 5. Field Finish Coat: Tnemec L69-Color HBE II at 200 to 250 sq ft per gallon (3.0 to 6.0 mils DFT).
  - 6. Total System Thickness (including primer coats): 6.7 to 11.5 mils DFT.
- I. High-Performance Coating - Type 7: Not Used.
- J. High-Performance Coating - Type 8: Epoxy-polyamidoamine finish system, satin sheen finish.
  - 1. Interior Applications: PVC, plastic, sprinkler piping, conduit, and other locations noted on Drawings.
  - 2. Surface Preparation: Clean and dry according to SSPC-SP 1. Degloss as required with 150 to 200 grit sandpaper. Prepared surfaces must be clean, dry, and contaminant-free prior to application of field-applied finish coats.
  - 3. First Coat: Tnemec L69-Color HBE II at 250 to 300 sq ft per gallon (2.0 to 4.0 mils DFT).
    - a. Color: Contrasting color.
  - 4. Field Finish Coat: Tnemec L69-Color HBE II at 250 to 300 sq ft per gallon (2.0 to 4.0 mils DFT).
  - 5. Total System Thickness (including primer coats): 4.0 to 8.0 mils DFT.

### 2.03 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- F. Test shop-applied primer for compatibility with subsequent cover materials.
- G. 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. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 16 percent, unless otherwise specified.
  - 2. Gypsum Board: 12 percent, maximum.
- H. Masonry: Verify masonry joints are struck flush.
- I. Proceed with coating application only after unacceptable conditions have been corrected.
  - 1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.02 PREPARATION

- A. Clean surfaces of loose foreign matter.
- B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- C. Remove finish hardware, fixture covers, and accessories and store.
- D. Surface Preparation: Prepare surfaces to receive high-performance coatings as specified in this Section for each high-performance coating system.

### 3.03 PRIMING

- A. Apply primer to specified surfaces. Apply in accordance with coating manufacturer's instructions and as specified in this Section.
- B. Apply specified primer for each applicable substrate to surfaces that will be concealed or embedded within or immediately adjacent to corrosive Natatorium environment; locations and applications include but are not limited to chases behind CMU pilasters, beam pockets, and within other similar enclosures.

### 3.04 COATING APPLICATION

- A. Apply coatings in accordance with manufacturer's instructions, to minimum thicknesses and coverage rates specified.
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

### 3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspector's Services:
  - 1. Verify coatings and other materials are as specified.
  - 2. Verify surface preparation and application are as specified.
  - 3. Verify DFT of each coat and total DFT of each coating system are as specified using wet film and dry film gauges.
  - 4. Coating Defects: Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.
  - 5. Report:
    - a. Submit written reports describing inspections made and actions taken to correct nonconforming work.
    - b. Report nonconforming work not corrected.
    - c. Submit copies of report to Architect and Contractor.
- C. Manufacturer's Field Services: Manufacturer's representative will provide technical assistance and guidance for surface preparation and application of coating systems.

### 3.06 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

### 3.07 PROTECTION

- A. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.
- B. Protect finished work from damage.

### 3.08 POST-OCCUPANCY INSPECTION

- A. Owner will set date for inspection of coating systems approximately one year from Date of Substantial Completion.
  - 1. Attendance: Owner, Architect, Contractor, and manufacturer's representative.
  - 2. Repair deficiencies in coating systems (if any) as determined by Architect according to manufacturers instructions.

**END OF SECTION**

**SECTION 099623**  
**GRAFFITI RESISTANT COATINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Graffiti-resistant coating to exterior stone surfaces.
- B. Surface preparation.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.
  - 1. Discuss manufacturer's application limitations and requirements.

**1.03 SUBMITTALS**

- A. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.
- B. Manufacturer's Application Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.
- C. Manufacturer's Field Reports: Report whether manufacturer's "best practices" are being followed; if not, state corrective recommendations. Email report to Architect the same day as inspection occurs; mail report on manufacturer's letterhead to Architect within 2 days after inspection.

**1.04 QUALITY ASSURANCE**

- A. Applicator Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience

**1.05 MOCK-UP**

- A. Mock-up: Prepare a representative surface 36 by 36 inch in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.
  - 1. For proposed substitutions, prepare side-by-side mock-ups of specified and substitute products.
  - 2. Locate where directed.
  - 3. Mock-up may remain as part of the Work.

**1.06 FIELD CONDITIONS**

- A. Protect liquid materials from freezing.
- B. Do not apply coating when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.
- C. Do not apply coatings, except with the written recommendation of the manufacturer, when the substrate surfaces have cured for less than a period of 60 days; when rain or temperatures below 50 degrees F are predicted for a period of 24 hours; earlier than 3 days after the surfaces became wet from rainfall or other moisture sources; when the substrate is frozen; or on substrate temperature of less than 40 degrees F.
- D. Do not apply coatings when wind velocity is higher than 20 mph.

**1.07 WARRANTY**

- A. Manufacturer Warranty: Provide five year manufacturer warranty for graffiti coatings.
  - 1. Include coverage for reduction in graffiti resistance on designated substrate.
  - 2. Include coverage to re-apply failed coating.

**PART 2 PRODUCTS**

**2.01 COATING MATERIALS**

- A. Coatings: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
  - 1. Maintains dry appearance when wetted.

- B. Exterior Graffiti Coating: Proprietary hybrid water-repellent with graffiti control properties or solvent-based aliphatic urethane coating system; non-glossy, colorless, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
  - 1. Number of Coats: Manufacturer's standard; minimum two, including primer, base coat and top coat as required by manufacturer for selected product.
  - 2. Acceptable Products:
    - a. Euclid Chemical Company; TAMMS AG 400 Permanent Anti-Graffiti Coating: [www.euclidchemical.com](http://www.euclidchemical.com).
    - b. PROSOCO, Inc.; Weather Seal Blok-Guard & Graffiti Control: [www.prosoco.com](http://www.prosoco.com).
    - c. Rain Guard Pro; Micro-Seal with Graffiti Control: [www.rainguardpro.com](http://www.rainguardpro.com).

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application.

#### **3.02 PREPARATION**

- A. Protection of Adjacent Work:
  - 1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
  - 2. Protect adjacent surfaces not intended to receive coatings.
- B. Prepare surfaces to be coated as recommended by coating manufacturer for best results.
- C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.
- D. Remove loose particles and foreign matter.
- E. Remove oil and foreign substances with a chemical solvent that will not affect coatings.
- F. Scrub and rinse surfaces with water and let dry.
- G. Allow surfaces to dry completely to degree recommended by coating manufacturer before starting coating work.

#### **3.03 APPLICATION**

- A. Apply in accordance with coating manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply at rate recommended by coating manufacturer, continuously over entire surface.
- C. Comply with coating manufacturer's instructions for limitations on drying time between coats, and for drying times after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if recommendations are not applicable to project conditions.
- D. Delay application of coating until installation of sealants has been completed in joints adjoining surfaces to be coated.
- E. Remove coating from unintended surfaces immediately by a method instructed by coating manufacturer.
- F. Provide manufacturer's field service representative to inspect preparation and application work continuously during entire application period to ensure that manufacturer's "best practices" for preparation and application are being followed.

**END OF SECTION**

## SECTION 101400

### SIGNAGE

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Signs required for Building Code compliance and building occupancy.

##### 1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

##### 1.03 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- B. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
  - 1. When room numbers to appear on signs differ from those on Drawings, include the drawing room number on schedule.
  - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
  - 3. Submit for approval by Owner through Architect prior to fabrication.
- C. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

##### 1.04 QUALITY ASSURANCE

- A. Basis of Design: Specifications are based on sign types by specified basis of design manufacturer. Sign types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, profile, and finishes are minor, and do not detract substantially from the indicated design intent.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

##### 1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Basis of Design Manufacturer:
  - 1. Styles and Design: As indicated on Drawings.
- B. Unless otherwise specified for an individual product or material, supply all products specified in this Section from the same manufacturer.

##### 2.02 CODE-REQUIRED SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.



- B. Code-Required Door and Room Identification Signs: Provide all signs required by Authority Having Jurisdiction (AHJ) for building occupancy; determine requirements and report to Owner and Architect prior to making specified submittals. Include cost of these signs in Contract Sum.
  - 1. Sign Type: Flat signs with applied character panel media as specified for other signs.
  - 2. Sign Types Required:
    - a. Room identification with symbols.
    - b. Room names.
    - c. Maximum occupancy.
    - d. Changeable message room identifications.
    - e. Wayfinding directional and area identification.
    - f. Changeable information sign holders with message inserts.
    - g. Exterior room identification signs.

### 2.03 SIGN STANDARDS

- A. It is the intent of these specifications to establish a sign standard for the Owner including but not limited to primary and secondary directories, wall mounted and overhead directionals, flag mounted directionals, primary room identification, restrooms, conference room, work station ID's and all code compliant signage. The Owner may not obtain all signs and sign types indicated; provide design for all indicated signs and submit specified shop drawings for all indicated signs.
- B. Typography:
  - 1. Type Style and Copy: True, clean, accurate reproduction of typeface(s) specified. Provide upper and lower case or all caps. Set normal letter spacing and interline spacing by manufacturer.
  - 2. Arrows, Symbols and Logo Art: Provided in style, sizes, colors and spacing as shown on Drawings.
  - 3. Grade II Braille: Perfectly round, clear insertion beads.
- C. Color and Finishes:
  - 1. Colors, Patterns and Artwork: See Drawings.
  - 2. Message Background: See Drawings.
  - 3. Finishes: Comply with current federal ADA and all state and local requirements.

### 2.04 INTERIOR SIGNS

- A. Signage System:
  - 1. Incorporate sign background panels with applied graphics including all tactile requirements in compliance with ADA specifications.
  - 2. Provide all signs, including work station and room identifications, overheads and flag mounts, directionals and directories with matching appearance and constructed utilizing same manufacturing process to assure consistent look throughout.
- B. Materials:
  - 1. Sign Background and Face: As indicated on Drawings.
  - 2. Sign Edges: As indicated on Drawings.
  - 3. Tactile Lettering: Precision machined, raised 1/32 inch thick matte PETG, and subsurface colored for scratch resistance.
- C. Construction:
  - 1. Sign Surfaces: Precision machined to a 90-degree angle; smooth edges, without chips, burrs, sharp edges, and marks.
  - 2. Utilize an acrylic sphere for Grade II Braille inserted directly into sign face. Pressure fit Braille dots in high tolerance drilled holes.
  - 3. Braille Dots: Half hemispherical domed and protruding a minimum 0.025 inch.
  - 4. Utilize pressure activated adhesive; non-hazardous and allowing for flexing and deflection of adhered components due to changes in temperature and moisture without bond failure.
  - 5. Provide signs with appropriate mounting hardware; finished, architectural in appearance, and suitable for indicated mounting surfaces.
  - 6. Some signs may be installed on glass. Place blank sign panel on opposite side of glass to cover tape and adhesive; match sign in size and shape.

- D. Printed Inserts:
  - 1. Capable of accepting paper or acetate inserts to allow changing and updating as required.
  - 2. Insert Components: 0.080 inch thick non-glare acrylic window, inlaid flush to sign face for smooth, seamless appearance.
  - 3. Provide and install all signage inserts.
  - 4. Provide template containing layout, font, color, artwork and trim lines to allow Owner to produce inserts on laser or ink jet printer. Provide template in Adobe Acrobat or Word format (.pdf).
- E. Color and Font: As indicated on Drawings.
  - 1. Background Panels: As indicated on Drawings.
  - 2. Character Color: As indicated on Drawings.

## **2.05 ACCESSORIES**

- A. Mounting Devices: Except as specified for each sign type, provide mounting devices specifically recommended by manufacturer for indicated application; concealed upon finished installation.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights in accordance with ADA Standards and ICC A117.1.
- D. Locate signs where indicated:
  - 1. Room and Door Signs: Locate on wall at latch side of door with tactile characters located minimum 48 inches above finished floor and maximum 60 inches above finished floor, and 3 inches from door frame, unless indicated otherwise.
  - 2. If no location is indicated obtain Architect's instructions.
- E. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

**END OF SECTION**

**SECTION 102113.17**  
**PHENOLIC TOILET COMPARTMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Phenolic toilet compartments.
- B. Urinal screens.

**1.02 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with placement of support framing and anchors in walls and ceilings.
  - 2. Coordinate location and installation of toilet accessories mounted on or in immediate proximity to toilet partitions.

**1.04 SUBMITTALS**

- A. Product Data: Provide data on panel construction, hardware, and accessories.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- C. Samples: Submit manufacturer's full range of available colors and patterns, as indicated on Drawings.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**1.05 QUALITY ASSURANCE**

- A. Provide all partitions by same manufacturer.
- B. Basis of Design: Specifications are based on partition types and model numbers by the specified basis of design manufacturer. Partition types manufactured by other acceptable manufacturers are permitted, subject to compliance with all specified requirements; and provided that deviations in dimensions, sizes, style, and finish are minor, and do not detract substantially from the indicated design intent.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. Bobrick Washroom Equipment, Inc.; DuraLine 1082 Series Compact Laminate: [www.bobrick.com](http://www.bobrick.com).

**2.02 PHENOLIC TOILET COMPARTMENTS**

- A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-mounted headrail-braced.
  - 1. Comply with NFPA 286, Class B, for finish surfaces of partition systems.
  - 2. Core Color: Black.
  - 3. Panel Face Color: Color(s) as indicated on Drawings, or selected from manufacturer's full line including additional lead time selections.
    - a. Substitution of basis of design manufacturer must provide same laminate finish as selected by Architect from basis of design manufacturer.
- B. Doors:
  - 1. Thickness: 3/4 inch.
  - 2. Width: 24 inch.
  - 3. Width for Handicapped Use: 36 inch.
  - 4. Height: 58 inch.

- C. Panels:
  - 1. Thickness: 1/2 inch.
  - 2. Height: 58 inch.
  - 3. Depth: As indicated on Drawings.
- D. Pilasters:
  - 1. Thickness: 3/4 inch.
  - 2. Width: As required to fit space; minimum 3 inch.
- E. Urinal Screens: Without doors; to match compartments; mounted to wall with continuous panel brackets with vertical support/bracing same as compartments.
  - 1. Minimum Size: 18 inches wide by 48 inches high, bottom edge positioned 12 inches above floor surface.

### 2.03 ACCESSORIES

- A. Pilaster Shoes: Formed ASTM A666, Type 304 stainless steel with No. 4 finish, 3 inch high, concealing floor fastenings.
  - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Hollow stainless steel, 1 inch by 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.
- C. Wall and Pilaster Brackets: Satin stainless steel; continuous type.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
  - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- E. Hardware: Satin stainless steel:
  - 1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
  - 2. Nylon bearings.
  - 3. Thumb turn door latch with exterior emergency access feature. Comply with ADA Standards at accessible compartment stalls.
  - 4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
  - 5. Coat hook with rubber bumper; one per compartment, mounted on door unless otherwise indicated on Drawings.
  - 6. Provide door pull for outswinging doors.
- F. Privacy Features: Provide manufacturer's optional privacy features, including the following:
  - 1. Rabbeted (overlapped) latch jambs on door edges.
  - 2. Continuous panel and pilaster brackets, including wall brackets, to prevent visibility into stalls.
  - 3. Applied, continuous, resilient or articulating privacy strips at hinge and latch jambs on door edges to prevent visibility into stalls when door is in closed and latched position.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as instructed by the manufacturer.
- 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 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.

B. Maximum Variation From Plumb: 1/8 inch.

**3.04 ADJUSTING**

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- 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 102113.19**  
**SOLID PLASTIC TOILET COMPARTMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Solid plastic toilet compartments.
- B. Urinal screens.

**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.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with placement of support framing and anchors in walls.
  - 2. Coordinate location and installation of toilet accessories mounted on or in immediate proximity to toilet partitions.

**1.04 SUBMITTALS**

- A. Product Data: Provide data on panel construction, hardware, and accessories.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- C. Samples: Submit manufacturer's full range of available colors, for selection.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. ASI Accurate Partitions: [www.asi-accuratepartitions.com/#sle](http://www.asi-accuratepartitions.com/#sle).
  - 2. ASI Global Partitions: [www.asi-globalpartitions.com/#sle](http://www.asi-globalpartitions.com/#sle).
  - 3. Hadrian: [www.hadrian-inc.com/#sle](http://www.hadrian-inc.com/#sle).
  - 4. Inpro: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  - 5. Scranton Products: [www.scrantonproducts.com/#sle](http://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); floor-mounted headrail-braced.
  - 1. Comply with NFPA 286, Class B, for finish surfaces of partition systems.
  - 2. Color: As selected by Architect from manufacturer's full line.
- B. Doors:
  - 1. Thickness: 1 inch.
  - 2. Width: 24 inch; 32 inch at ambulatory accessible stalls.
  - 3. Width for Handicapped Use: 36 inch, out-swinging.
  - 4. Height: 55 inch.
- C. Panels:
  - 1. Thickness: 1 inch.
  - 2. Height: 55 inch.
  - 3. Depth: As indicated on Drawings.
- D. Pilasters:
  - 1. Thickness: 1 inch.
  - 2. Width: As required to fit space; minimum 3 inch.
- E. Screens: Without doors; to match compartments; mounted to wall with continuous panel brackets.
  - 1. Urinal Screens - Minimum Size: 24 inches wide by 48 inches high, bottom edge positioned 12 inches above floor surface.

### 2.03 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
  - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
  - 1. Size: Manufacturer's standard size.
- 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. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
- 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.
- G. Privacy Features: Provide manufacturer's optional privacy features, including the following:
  - 1. Rabbeted (overlapped) latch jambs on door edges.
  - 2. Continuous panel and pilaster brackets, including wall brackets, to prevent visibility into stalls.
  - 3. Applied, continuous, resilient or articulating privacy strips at hinge and latch jambs on door edges to prevent visibility into stalls when door is in closed and latched position.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated on Drawings.
- 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 space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices. Adjust locations of brackets as required to eliminate conflict with wall tile edges and other transitions between dissimilar wall finish materials.
- 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.
- B. Maximum Variation From Plumb: 1/8 inch.

#### 3.04 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- 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 102239**  
**FOLDING PANEL PARTITIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Top-supported folding panel partitions, horizontal opening.

**1.02 REFERENCE STANDARDS**

- A. ANSI A208.1 - American National Standard for Particleboard.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions.
- F. NEMA LD 3 - High-Pressure Decorative Laminates.

**1.03 SUBMITTALS**

- A. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.
- B. 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.
- C. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.
- D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention, and installation sequence.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
  - 1. Furnish extra panel finish materials, matching installed materials, in quantity to cover both sides of two typical panels when installed.
  - 2. Package maintenance materials with protective covering for storage, identified with descriptive labels.
  - 3. Tools: One each of every special tool required for operation of partition system.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of this Section with minimum five years of documented experience.
- B. Basis of Design: Specifications are based on partition systems and model numbers by the specified basis of design manufacturer. Partition systems manufactured by other acceptable manufacturers are permitted, subject to compliance with all specified performance requirements; and provided that deviations in dimensions, sizes, style, and finish are minor, and do not detract substantially from the indicated design intent.

**1.05 FIELD MEASUREMENTS**

- A. Verify partition openings and storage arrangements by field measurements before fabrication, and indicate measurements on shop drawings.
- B. Where field dimensions cannot be made without delaying the work, establish required opening and storage dimensions as instructed by the manufacturer and maintain those dimensions for actual installation of partitions.



## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until installation.
- B. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used in shop drawings. Do not use permanent markings on panels.

## 1.07 WARRANTY

- A. Manufacturer Warranty: Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Basis of Design Manufacturer:
  - 1. Modernfold, a DORMA Group Company; Acousti-Seal Encore: [www.modernfold.com/#sle](http://www.modernfold.com/#sle).
- B. Other Acceptable Manufacturer:
  - 1. Hufcor, Inc.; Series 642: [www.hufcor.com/#sle](http://www.hufcor.com/#sle).

### 2.02 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

- A. Folding Panel Partitions: Center or side opening as indicated on Drawings opening; paired panels; side stacking; manually operated.
- B. Panel Construction:
  - 1. Frame: Minimum 18 gauge, 0.0478 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
  - 2. Substrate: Medium-density fiberboard; single or multiple sheets to achieve specified acoustical performance.
  - 3. Panel Substrate Facing: Steel sheet, manufacturer's standard thickness.
  - 4. Hinges: manufacturer's standard concealed type; manufacturer's standard gage and thickness; stainless steel.
  - 5. Hardware: Latching door handles of cast steel, satin chrome finish; lock cylinder keyed to building keying system.
  - 6. Panel Properties:
    - a. Thickness With Finish: Minimum 3 inches.
    - b. Width: Equal widths, unless otherwise indicated.
- C. Panel Finishes:
  - 1. Facing: Plastic laminate, or as indicated on Drawings.
  - 2. Exposed Metal Trim: Custom powder coated paint finish; color as selected by Architect from manufacturer's full line.
- D. Acoustic Seals: Provide types of seals that produce operable panel partitions that comply with specified acoustical performance requirements, made from materials and to profiles that minimize sound leakage, and tight-fitting at contact surfaces. Seals to provide continuous seal between adjacent panels, and between operable panel partition perimeter and adjacent surfaces when partition is fully extended, closed, and in place.
  - 1. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of panel, with continuous acoustical seal.
  - 2. Horizontal Top Seals: Extruded PVC or PVC-faced, mechanically retractable type, exerting a uniform constant pressure on track when extended.
  - 3. Horizontal Bottom Seals: PVC-faced, constant force contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing, and resisting panel movement; extension and retraction by operating handle or built-in operating mechanism automatically by movement of partition with operating range not less than 1.5 inch clearance between retracted seal and floor finish.

- E. Suspension System:
  - 1. Track: Formed steel; manufacturer's standard size to suit panel sizes and weights, thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
  - 2. Carriers: Steel, ball bearing wheels on trolley carrier at top of every panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.
- F. Performance:
  - 1. Acoustic Performance:
    - a. Sound Transmission Class (STC): Minimum 50, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
  - 2. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
  - 3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.
- G. Accessories:
  - 1. Ceiling Closure: White enameled ceiling closure; aluminum jamb and head molding, fittings and attachments.
  - 2. Storage Pocket Door: Full height at end of partition tracks to conceal stacked partition; of same materials, finish, construction, thickness, and acoustical qualities as partition panels; complete with operating hardware and hinges finished to match other exposed hardware.
    - a. Manufacturer's standard method to secure pocket door in closed position.
    - b. Lock: Key-operated lock cylinder, keyed to building master system, to secure pocket door in closed position; include two keys per lock.
  - 3. Acoustic Sealant: As recommended by partition manufacturer.

### 2.03 MATERIALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Medium Density Fiberboard: ANSI A208.1; composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.
- C. Plastic Laminate: NEMA LD 3, HGS; color as selected; finish as selected.
- D. Acoustic Insulation:
  - 1. Type: As required for acoustic performance indicated.
  - 2. Thickness: As required for acoustic performance indicated.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as required by the manufacturer.
- B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.
- C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.
- D. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

### 3.02 INSTALLATION

- A. Install partition in accordance with manufacturer's instructions and ASTM E557.
- B. Fit and align partition assembly level and plumb.
- C. Lubricate moving components.
- D. Install acoustic sealant to achieve required acoustic performance.

### 3.03 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.

**3.04 CLEANING**

- A. Clean finish surfaces and partition accessories.

**3.05 CLOSEOUT ACTIVITIES**

- A. See Section 017900 - Demonstration and Training, for additional requirements.
- B. Demonstrate operation of partition and identify potential operational problems.

**END OF SECTION**

**SECTION 102813**  
**TOILET SHOWER, AND UTILITY ROOM ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Manufactured accessories, including:
  - 1. Commercial toilet accessories.
  - 2. Commercial shower accessories.
  - 3. Utility room accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 088300 - Mirrors: Mirrors in toilet and shower areas as indicated n Drawings.

**1.03 REFERENCE STANDARDS**

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- B. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- C. ASTM F446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.
- D. ICC A117.1 - Accessible and Usable Buildings and Facilities.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate locations of accessories with other work to avoid interference, and to assure proper operation and servicing of accessory units.
  - 2. Coordinate location and installation of toilet accessories mounted on or in immediate proximity to toilet partitions.
  - 3. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

**1.05 SUBMITTALS**

- A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- B. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

**1.06 QUALITY ASSURANCE**

- A. Provide accessories by the same manufacturer for each type of accessory unit, and for units exposed in the same areas, to ensure matching of finishes.
- B. Comply with ASTM F446 for grab bars and accessories, including, anchorage, test methods, and performance.
- C. Basis of Design: Specifications and Drawings are based on accessory types and model numbers by the specified basis of design manufacturer. Accessory types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in dimensions and profile are minor, and do not detract substantially from the indicated design intent.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Do not deliver accessories to site until rooms in which they are to be installed are ready to receive them.
- B. Pack accessories individually in a manner to protect accessory and its finish.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. Manufacturers and products as specified on Drawings.

### **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.
  - 1. Grind welded joints smooth.
  - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Keys: Provide two keys for each accessory to Owner.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Mirror Glass: Specified in Section 088300.
- E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- F. 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.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.
- C. Back paint components where contact is made with building finishes to prevent electrolysis.

## **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.
- E. See Section 061000 and 092116, as applicable, for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

### **3.02 PREPARATION**

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.
- C. Before starting work notify Architect in writing of any conflicts detrimental to installation or operation of units.
- D. Verify with Architect exact locations of accessories.

### **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 on Drawings.
- D. Use concealed fasteners wherever possible.
- E. Where exposed mounting devices and fasteners are necessary, provide such devices finished to match accessory; use security type fasteners for all exposed accessory mountings.
- F. Unless otherwise indicated, align accessory units with adjacent fixtures and other elements within the same area. Conform to ICC A117.1 for mounting structural strength, positions, and mounting heights.

**3.04 PROTECTION**

- A. Protect installed accessories from damage due to subsequent construction operations.
- B. Protect adjacent or adjoining finished surfaces and work from damage during installation of work of this Section.
- C. Protect exposed accessory finishes from damage until final acceptance of the Work.

**3.05 CLEANING AND ADJUSTMENT**

- A. Clean and polish all exposed surfaces after installation, and after removal of labels and protective coatings or coverings.
- B. Test and adjust accessories for proper and smooth operation.

**END OF SECTION**

**SECTION 104116**  
**EMERGENCY KEY BOXES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire department lock boxes for emergency key storage.

**1.02 SUBMITTALS**

- A. Product Data: Manufacturer's catalog literature for specified specialty items, marked to clearly show products to be furnished for this project.
- B. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

**1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

**PART 2 PRODUCTS**

**2.01 FIRE DEPARTMENT LOCK BOX**

- A. Fire Department Lock Box: Heavy-duty, recessed, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
  - 1. Capacity: Holds 10 keys.
  - 2. Finish: Manufacturer's standard dark bronze.
  - 3. Include location stickers as required by local jurisdiction.
  - 4. Acceptable Products:
    - a. Knox Company; Knox-Box Rapid Entry System, Model 3200R (recessed): [www.knoxbox.com](http://www.knoxbox.com).
    - b. Substitutions: Not permitted.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install specified items in accordance with manufacturer's instructions and applicable jurisdictional requirements.
  - 1. Confirm required location with authority having jurisdiction prior to installation.
- B. Use templates provided by item manufacturer.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as required for proper installation and operation.

**3.02 ADJUSTING**

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.
- C. Replace units which cannot be adjusted and lubricated to operate freely and smoothly.

**3.03 PROTECTION**

- A. Do not permit adjacent work to damage hardware or finish.

**END OF SECTION**

**SECTION 104400**  
**FIRE PROTECTION SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

**1.02 REFERENCE STANDARDS**

- A. FM (AG) - FM Approval Guide.
- B. NFPA 10 - Standard for Portable Fire Extinguishers.
- C. UL (DIR) - Online Certifications Directory.

**1.03 SUBMITTALS**

- A. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.
- B. Shop Drawings: Indicate cabinet physical dimensions, cabinet physical dimensions, rough-in measurements for recessed cabinets, locations of individual fire extinguishers, mounting measurements for wall bracket, installation procedures, and accessories required for complete installation.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

**1.04 FIELD CONDITIONS**

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Activar Construction Products Group - JL Industries: [www.activarcpg.com/#sle](http://www.activarcpg.com/#sle).
  - 2. Kidde, a unit of United Technologies Corp.: [www.kidde.com](http://www.kidde.com).
  - 3. Larsen's Manufacturing Co.: [www.larsensmfg.com](http://www.larsensmfg.com).
  - 4. Nystrom, Inc.: [www.nystrom.com](http://www.nystrom.com).
  - 5. Potter-Roemer: [www.potterroemer.com/#sle](http://www.potterroemer.com/#sle).

**2.02 FIRE EXTINGUISHERS**

- A. General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
  - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
  - 1. Stored Pressure Operated: Deep Drawn.
  - 2. Class: A:B:C type.
  - 3. Size: 10 pound.
  - 4. Finish: Baked polyester powder coat, red color.
  - 5. Temperature Range: -65 degrees F to 120 degrees F.

**2.03 CABINETS**

- A. Cabinet Construction: Non-fire rated.
  - 1. Formed steel or stainless steel sheet; 0.036 inch thick base metal.



- B. Cabinet Configuration: Semi-recessed type, unless otherwise indicated or specified.
  - 1. Sized to accommodate scheduled items and accessories.
  - 2. Semi-Recessed Cabinets: Maximum 4 inch projection from wall surface, including handles and other components.
  - 3. Trimless type.
  - 4. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.
- D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- E. Fabrication: Weld, fill, and grind components smooth.
- F. Finish of Cabinet Exterior Trim and Door:
  - 1. Wet Locations: No. 4 - Brushed stainless steel.
  - 2. Non-Wet Locations: Baked enamel, white color.
- G. Finish of Cabinet Interior: White colored enamel.

#### **2.04 ACCESSORIES**

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Lettering: "FIRE EXTINGUISHER" decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify rough openings for cabinet are correctly sized and located.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Fire Extinguisher Cabinets: Install cabinets plumb and level in wall openings, maximum 30 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets and on wall brackets as indicated; see Drawings for locations of extinguishers on wall brackets.

**END OF SECTION**

**SECTION 105129**  
**PHENOLIC LOCKERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Phenolic lockers.

**1.02 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- B. Shop Drawings: Indicate locker plan and elevation layouts, locker construction details, accessible locker locations, and numbering plan.
- C. Samples: Submit samples 2 x 3 inches in size, of available phenolic colors and patterns, as indicated on Drawings.

**1.04 QUALITY ASSURANCE**

- A. Provide all lockers by same manufacturer.
- B. Basis of Design: Specifications are based on locker types and model numbers by the specified basis of design manufacturer. Locker types manufactured by other acceptable manufacturers are permitted, subject to compliance with all specified requirements; and provided that deviations in dimensions, sizes, style, and finish are minor, and do not detract substantially from the indicated design intent.

**1.05 MOCK-UP**

- A. Mock-up: Provide mock-up of one full size locker with lighted top detail, in selected colors.
  - 1. Mock-up may remain as part of the Work.
  - 2. Include both locking options and magnetic catch.
  - 3. Locate where directed.
  - 4. Lighted top detail if indicated on Drawings.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect locker finish and adjacent surfaces from damage.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. Summit Lockers, Inc.; Phenolic Locker: [www.summitlockers.com](http://www.summitlockers.com).
  - 2. Substitution of basis of design manufacturer must provide same laminate finish as selected by Architect from basis of design manufacturer.
- B. Other Acceptable Manufacturer:
  - 1. Columbia Lockers, a division of PSiSC: [www.psisc.com](http://www.psisc.com).

**2.02 LOCKER APPLICATIONS**

- A. Wardrobe Lockers: Phenolic lockers, free-standing for base indicated on Drawings.
  - 1. Accessibility: Comply with ICC A117.1 and ADA Standards.
  - 2. Locker Configurations: As indicated on Drawings.
  - 3. Fittings: Size and configuration as indicated on Drawings.
    - a. Single shoe shelf.
    - b. Coat rod.
    - c. Hooks: Two double prong.
  - 4. Ventilation: By open space between the back of the door and locker body, and 5/16 inch diameter holes in tops, bottoms, and intermediate shelves including "Z" type intermediary shelves.
  - 5. Magnetic Catches: Located on all lockers.

6. Locking: Padlock hasps, for padlocks provided by Owner, except as otherwise specified; comply with ADA Standards.
7. Provide manufacturer's standard top (white body material), unless otherwise indicated on Drawings.

### 2.03 PHENOLIC LOCKERS

- A. Lockers: Factory assembled, made of phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.
  1. Doors: Full overlay, covering full width and height of locker body; square edges.
  2. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
  3. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
  4. Provide filler strips where indicated, securely attached to lockers.
  5. Door Color: As specified below.
  6. Body Interior Color: Manufacturer's standard white or light color.
  7. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.
- B. Component Thicknesses:
  1. Doors and Ancillary Panels: 1/2 inch minimum thickness.
  2. Locker Body: One of the following combinations:
    - a. Tops, bottoms, and shelves 3/8 inch; sides 5/16 inch; backs 1/4 inch; minimum.
  3. End Panels and Filler Panels: 1/2 inch minimum thickness.
- C. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with core-color finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels not acceptable.
  1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.
  2. Color: "Wood-Look" finish and color selected from manufacturer's full line, including special order or long-lead items.
  3. Basis of Design Product:
    - a. Trespa North America; Meteon Panel: [www.trespanorthamerica.com](http://www.trespanorthamerica.com).
- D. Hinges: Stainless steel, satin finish; minimum of 90 degree opening; concealed cabinet style hinge attached with tamperproof screws.
  1. Accessible Lockers: Minimum 180 degree opening.
- E. Coat Hooks: Stainless steel or reinforced nylon; attached with tamperproof screws.
- F. Number Plates: Manufacturer's standard, minimum 4-digit, permanently attached with adhesive; may be field installed.
- G. Built-In Lock Boxes: Stainless steel; manufacturer's standard size, with padlock hasps, for padlocks provided by Owner.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and miscellaneous panels.
- G. Install accessories.

H. Replace components that do not operate smoothly.

**3.03 ADJUSTING**

A. Adjust locker doors for proper operation; assure that doors do not swing open when unattended.

B. Shim or properly re-install doors as required to result in proper operation.

**3.04 CLEANING**

A. Clean locker interiors and exterior surfaces.

**END OF SECTION**

**SECTION 108213**  
**EQUIPMENT SCREENS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pre-formed metal panel equipment screens, including:
  - 1. Attachment frame system.
  - 2. System accessories.
- B. Design engineering of equipment screen system.

**1.02 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the Work with installation of affected rooftop equipment and associated curb supports.

**1.04 SUBMITTALS**

- A. Shop Drawings: Indicate system and panel layout plan and elevations, component connection details, clearance dimensions, tolerances, frame details, and details of interface with adjacent construction and equipment.
- B. Product Data: Provide data describing system characteristics, standard detail sheets, and system limitations.
- C. Samples: Submit samples of available plastic panel colors, for selection.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of experience.
- B. Perform design under direct supervision of a Professional Engineer experienced in design of this Work and licensed in California.
- C. Basis of Design: Drawing details are based on screen and support profiles by specified basis of design manufacturer. Similar profiles by other acceptable manufacturers are permitted, subject to compliance with all specified performance characteristics, and provided that deviations in dimension, profile, performance, and finish are minor and do not detract from the indicated design intent.

**1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Provide wrapping to protect pre-finished panel surfaces. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Basis of Design Manufacturer:
  - 1. Metalwerks; LINEA Equipment Screen System: [www.metalwerksusa.com/#sle](http://www.metalwerksusa.com/#sle).

**2.02 DESIGN REQUIREMENTS**

- A. General: Design system to resist snow, wind, suction, and uplift loading at any point in the system without damage or permanent set.
- B. Framing: Comply with minimum criteria according to ASCE 7.

**2.03 MATERIALS**

- A. Steel Framing: ASTM A653/A653M; minimum 18 gage thick or as require for indicated support conditions; with G90 coating.
- B. Metal Panels: Rigid galvalume metal sheets; minimum 24 gage thickness.

## **2.04 ACCESSORIES**

- A. Fasteners and Anchors: Galvanized steel type; sized and configured to comply with design requirements.
- B. Post Bases: Manufacturer's standard base units designed to support screen posts on roof surface without penetrating roof membrane.

## **2.05 FABRICATION**

- A. Factory-form panel system with continuous interlocking panel connections and indicated or required components. Form components true to shape, accurate in size, square, and free from distortion or visual defects.
- B. Cut panels to precise lengths required for proper fit on designated equipment units.
  - 1. Panel Configuration: Vertical.
  - 2. Panel Design: Horizontal; formed metal panel selected from manufacturer's standard line.
  - 3. Top Trim: Flat
- C. Provide special shaped corner panels and gate assemblies in accordance with manufacturer's standard details.
- D. Trim and Closures: Fabricated from minimum 24 gage metal, finished with manufacturer's standard coating system; provide top trim as indicated.
- E. Framing: Fabricate and assemble components in largest practical sizes for delivery to site.
  - 1. Construct corner frames to required shape with joints tightly fitted and welded.
  - 2. Supply components required for anchorage of framing. Fabricate anchors and related components of material and finish as required to comply with specified design requirements.

## **2.06 FINISHES**

- A. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
  - 1. Color: Selected from manufacturer's full range of standards.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that equipment items and associated curb supports are ready to receive work and unit dimensions are as indicated on shop drawings.

### **3.02 INSTALLATION**

- A. Install equipment screen system in accordance with manufacturer's instructions.
- B. Install system level and plumb.
- C. Secure screen assembly to equipment units without damaging operation of unit. Secure to internal equipment frame wherever possible.
- D. Provide corner and mid-span attachments as required to support panels uniformly.
- E. Insert panels into structural supports, except where fixed attachment points are indicated or required. Set panels tight to adjacent panels for uniform fit.
- F. Separate dissimilar metals with primer, bituminous coating, or other material to separate metals and prevent corrosion.
- G. Do not cut or abrade finishes that cannot be restored during installation.

### **3.03 TOLERANCES**

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/4 inch.

### **3.04 CLEANING**

- A. Clean surfaces and components immediately prior to Substantial Completion.

**END OF SECTION**

**SECTION 119900**  
**AQUATICS ROOM EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Aquatics operating equipment located in equipment room.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the installation of equipment items with size, location and installation of service utilities.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

**1.03 SUBMITTALS**

- A. Product Data: Provide product data for specified equipment items.
- B. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of work.

**PART 2 PRODUCTS**

**2.01 DAVIT CRANE**

- A. Acceptable Manufacturer
  - 1. OZ Lifting Products LLC: [www.ozliftingproducts.com](http://www.ozliftingproducts.com).
    - a. Model: ZTP2500DAV.
- B. Equipment Characteristics:
  - 1. Load Capacity: 2,500 lb.
  - 2. Hook Reach: 28.95 inch to 82.46 inch.
  - 3. Hook Height: 31.27 inch 100.45 inch; base selection by Architect.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

**3.02 ADJUSTING**

- A. Adjust operating components for smooth operation.

**3.03 CLEANING**

- A. Clean equipment items immediately before Substantial Completion.

**3.04 CLOSEOUT ACTIVITIES**

- A. Demonstrate proper operation of equipment to Owner's designated representative.
- B. Demonstration: Demonstrate operation of system to Owner's personnel.
  - 1. Use operation and maintenance data as reference during demonstration.
  - 2. Briefly describe function, operation, and maintenance of each component.
- C. Training: Train Owner's personnel on operation and maintenance of system.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  - 2. Provide minimum of two hours of training.
  - 3. Instructor: Manufacturer's training personnel.
  - 4. Location: At project site.

**3.05 PROTECTION**

- A. Protect installed equipment items from subsequent construction operations.

**END OF SECTION**

**SECTION 122400  
WINDOW SHADES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Interior manual roller shades.

**1.02 REFERENCE STANDARDS**

- A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- B. WCMA A100.1 - Safety of Window Covering Products.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
  - 2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.
  - 3. Coordinate with window installation and placement of concealed blocking to support shades.
- B. Sequencing:
  - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
  - 2. Do not install shades until final surface finishes and painting are complete.

**1.04 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- B. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
- C. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.
- D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- E. Selection Samples: Include fabric, fascia housing, and hardware samples in full range of available colors and patterns.
- F. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.
- G. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of this type with minimum three years of documented experience with shading systems of similar size and type.
  - 1. Manufacturer's authorized representative.
  - 2. Factory training and demonstrated experience.

**1.06 MOCK-UP**

- A. Mock-Up: Provide full size mock-up of window shade system complete with selected shade fabric including example of seams and batten pockets when applicable.
  - 1. Obtain Architect's approval of light and privacy characteristics of fabric prior to fabrication.
  - 2. Full-sized mock-up may become part of the final installation.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.



## 1.08 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.09 WARRANTY

- A. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
1. Shade Tubes: 5 years.
  2. Fabric: 10 years; all locations.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
1. Draper, Inc.: [www.draperinc.com/#sle](http://www.draperinc.com/#sle).
  2. Hunter Douglas Architectural: [www.hunterdouglasarchitectural.com/#sle](http://www.hunterdouglasarchitectural.com/#sle).
  3. Lutek Shading Systems: [www.lutek.com](http://www.lutek.com).
  4. MechoShade Systems LLC: [www.mechoshade.com/#sle](http://www.mechoshade.com/#sle).
  5. SWFcontract, a division of Springs Window Fashions, LLC.: [www.swfcontract.com/#sle](http://www.swfcontract.com/#sle).
- B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

### 2.02 ROLLER SHADES

- A. General:
1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
  2. Provide shade system that operates smoothly when shades are raised or lowered.
- B. Manually Operated Roller Shades:
1. Description: Single and/or double roller, manually operated fabric window shades.
    - a. Drop Position: Regular roll.
    - b. Mounting: As indicated on Drawings.
    - c. Fabric: As selected by Architect from manufacturer's full line.
  2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight, or as indicated on Drawings.
    - a. Material: Steel, 1/8 inch thick.
    - b. Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.
      - 1) Light-Filtering Fabric: Room-side of opening.
      - 2) Room-Darkening Fabric: Glass-side of opening.
    - c. Multiple Shade Band Operation: Provide hardware as necessary to operate more than one shade band using a single clutch operator.
  3. Roller Tubes: Basis of design manufacturer's "Somfy".
    - a. Material: Extruded aluminum.
    - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
    - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
    - d. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
  4. Hembars: Designed to maintain bottom of shade straight and flat.
    - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
  5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
    - a. Provide a permanently lubricated brake assembly mounted on an oil-impregnated hub with wrapped spring clutch.
    - b. Brake must withstand minimum pull force of 50 lb in the stopped position.
    - c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.

6. Manual Operation: See Drawings for locations of each operator type.
  - a. Crank Handle: Manufacturer's standard; finish selected by Architect from manufacturer's full line.
  - b. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 lb minimum breaking strength. Provide upper and lower limit stops.
    - 1) Chain Retainer: Chain tensioning device complying with WCMA A100.1.
7. Managed Lift: Required lifting force of 3 lb to a maximum of 8.5 lb for single-band or multi-band shades up to 5 bands and a maximum of 30 lb hanging weight.
8. Accessories:
  - a. Fascias: Size as required to conceal shade mounting.
    - 1) Style A: Surface mounted as selected by Architect from shade manufacturer's full selection.
    - 2) Style B: Special or custom trim pocket with bottom edge that functions as ceiling trim aligned with ceiling plane as detailed on Drawings.
    - 3) Material and Color: As selected by Architect from manufacturer's full line of available colors.
  - b. Room-Darkening Channels: If indicated on Drawings, extruded aluminum side and center channels with brush pile edge seals, SnapLoc mounting base, and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side light control and sill light control.
  - c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

### 2.03 SHADE FABRIC

- A. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
  1. Acceptable Manufacturers:
    - a. MechoShade Systems LLC: [www.mechoshade.com/#sle](http://www.mechoshade.com/#sle).
    - b. Mermet Corporation: [www.mermetusa.com/#sle](http://www.mermetusa.com/#sle).
    - c. Phifer, Inc.: [www.phifer.com/#sle](http://www.phifer.com/#sle).
  2. Material: 100 percent polyester.
  3. Performance Requirements:
    - a. Flammability: Pass NFPA 701 large and small tests.
    - b. Fungal Resistance: No growth when tested according to ASTM G21.
  4. Openness Factor: 5 percent openness, or as indicated on Drawings and as selected by Architect from manufacturer's full line.
  5. Roll Width: 72 inches, minimum.
  6. Color: As selected by Architect from manufacturer's full range of colors.
  7. Fabrication:
    - a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.
    - b. If height of opening requires multiple panels of railroaded fabric, use battens at seams.
    - c. Battens: Full width of shade, enclose in welded shade fabric pocket.

### 2.04 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
  1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
  2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
  3. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.
- C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.

- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Start of installation shall be considered acceptance of substrates.

**3.02 PREPARATION**

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

**3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.
- C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

**3.04 CLEANING**

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

**3.05 PROTECTION**

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

**END OF SECTION**

**SECTION 123600  
COUNTERTOPS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Countertops for architectural wood casework.
- B. Wall-hung counters and vanity tops.

**1.02 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- C. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material.
- D. NEMA LD 3 - High-Pressure Decorative Laminates.
- E. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII.
- F. PS 1 - Structural Plywood.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizing and configuration of countertops with associated casework and adjacent construction.
  - 2. Coordinate sizing and locations of cutouts for plumbing fixtures with base cabinet configurations for proper alignments as indicated on Drawings.

**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. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- D. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- E. Installation Instructions: Manufacturer's installation instructions and recommendations.
- F. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

**1.05 QUALITY ASSURANCE**

- A. 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. 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. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
  - 1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
    - a. Acceptable Manufacturers: As specified on Drawings.
  - 2. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
  - 3. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
  - 4. Finish: Matte or suede, gloss rating of 5 to 20.
  - 5. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; covered with matching laminate.
  - 6. Colors and Patterns: As scheduled on Drawings.
  - 7. Back and End Splashes: Same material, same construction; minimum 4 inches high.
  - 8. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Custom Grade.
- B. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
  - 1. Flat Sheet Thickness: 1-1/4 inch, minimum.
  - 2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.
    - a. Acceptable Manufacturers: As specified on Drawings.
  - 3. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).
  - 4. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
  - 5. Finish on Exposed Surfaces: Polished.
  - 6. Colors and Patterns: As scheduled on Drawings.
  - 7. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; edge profile as indicated on Drawings.
  - 8. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
  - 9. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.

### **2.02 ACCESSORY MATERIALS**

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, clear color.

### **2.03 FABRICATION**

- A. General: 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 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 walls with contact surfaces set in waterproof adhesive.
  - 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing and Composite Countertops: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

- D. Countertop Seams: Arrange seams symmetrically or in orderly locations, minimum 12 inches from edges of sink and similar cutouts.
- E. Wall-Mounted Countertops: Provide skirts, aprons, brackets, and braces as indicated on Drawings, finished to match.
  - 1. Support Brackets: Specified in Section 05 5000; sizes and configurations as indicated.

### **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.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

#### **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. 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.
- C. Seal joint between back/end splashes and vertical surfaces.

#### **3.04 TOLERANCES**

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

#### **3.05 CLEANING**

- A. Clean countertops surfaces thoroughly.

#### **3.06 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**

**131113  
POOL GENERAL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project administrative requirements that relate to Division 13 11 Pools.

**1.02 POOL ASSOCIATED BID ALTERNATES INCLUDE:**

- A. BID ALTERNATE #3 – Splashtacular Fly Time Slide (Slide C) – This slide is associated with Pool A. The Bid Alternate #3 shall include all Splashtacular materials (fiberglass, concrete slide foundations, steel support columns and necessary hardware to complete a full installation of the Fly Time slide. The Base Bid for this slide system shall include the pump pad and associated suction piping from the surge tank into the pool pump pit, supply piping to the slide tower location including piping stub up to 24” above deck elevation and capped. Additional piping associated with the slide drain system shall be installed from the gutter piping tees to a point 6’ out of the gutter system tee – cap and terminate 12” below deck. Slide Tower is shared with Slide A and Slide B and is base bid.
- B. BID ALTERNATE #4 – AquaClimb Aqua ZipN – This feature is associated with Pool B. Provide cost for furnish and installation of complete Aquiclimb ZipN including protective deck padding in location shown in plan drawings.
- C. BID ALTERNATE #5 – Reduced Flow - Play Structure – This feature is associated with Pool C. Bid Alternate #5 shall provide a cost for an alternative smaller Spray Structure equivalent to a Vortex 3 platform structure with a “dumping bucket style” feature with a maximum flow of 450 gpm for the entire structure. Design pump, VFD and piping for the base bid play structure shall remain the same size.

**1.03 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.
- B. The following contain requirements that relate in Division 13 11:
  - 1. Mechanical/Electrical/Equipment Coordination: General Conditions, Supplementary General Conditions and Division 01 General Requirements
  - 2. Earth Work and Pool Excavation: Division 31
  - 3. Concrete Deck Work: Division 03
  - 4. Mechanical: Plumbing Systems - Division 22, HVAC Systems and Equipment - Division 23
  - 5. Electrical: Division 26
- C. Applicable requirements of the following Codes and Standards apply to Work in Division 13 11:
  - 1. Association of Pool and Spa Professionals (APSP)
    - a. Minimum Standard for Public Swimming Pools
  - 2. National Electrical Code (NEC)
  - 3. National Sanitation Foundation (NSF): Seal of Approval Program
  - 4. American Society for Testing and Materials (ASTM): Specifications referenced herein.
  - 5. Governmental Health and Building Codes
  - 6. ADA Accessibility Guidelines for Buildings and Facilities
  - 7. American National Standards Institute

**1.04 REFERENCES**

- A. Refer to individual Division 13 11 sections.

**1.05 DESCRIPTION OF WORK**

- A. Work of Division 13 11 includes, but is not limited to, the following:
  - 1. **The Mytha Pools on this project will be Owner Furnished** – Contractor installed. See Specification 131117, Part 1, 1.04, A. (1 – 3) for description of responsibility of Owner,

Myrtha and Contractor concerning the Owner Furnish/Contractor install of the Myrtha pool systems.

2. Layout of all pool(s) and pool related work required under Division 13 11.
3. Project benchmarks and control points.
4. Excavation and stone fill as required for pool tank structure and pipe trenching. Refer to Division 01 and 31 for special conditions.
5. Pool vessels, as detailed on Contract Drawings and Shop Drawings.
6. Pool mechanical systems, including piping, recirculation system, filtration system, activity mechanical systems and water chemical treatment system.
7. Heating system for swimming pool. Coordinate venting and interlocking for pool heater(s) with HVAC Contractor.
8. Waterslide and water activity mechanical systems including all piping.
9. Pool subsurface water monitoring system – includes perforated piping (with silt sleeve) under pool floor slab and riser pipe to deck elevation.
10. Interior pool finishes.
11. Pool deck equipment and accessory equipment shown and/or specified, including required anchors embedded within the pool deck and coordination with Deck Contractor.
12. Coordination of all electrical interlocks for pool and pool related equipment.
13. Miscellaneous pool testing, safety and control equipment.
14. Low voltage wiring for pool and pool related equipment is installed and connected by the Swimming Pool Contractor unless required otherwise by code. Where code requires that low voltage wiring is installed by a licensed electrical contractor, low voltage wiring is specified in Electrical Documents.

B. Definitions

1. The term "pool" as used in Division 13 11 shall refer to the following:
  - a. Pool A – 50 Meter Competition Pool with 1 Meter Diving and Fly Time Water SlideMulti-sectional pool: Combination zero-depth entry/leisure, lap swimming and water slide plunge.
  - b. Pool B – Warm Up Pool
  - c. Pool C - Multi-sectional pool: Combination zero-depth entry/leisure pool/action channel and two runout slides..
2. The term "concrete" as used in Division 13 11 refers to concrete for swimming pool construction only.
3. The term "Architect/Engineer" as used in Division 13 11 refers to the swimming pool designer only.
4. The term "Contractor" as used in Division 13 11 refers to the swimming pool contractor only.
5. The term "Low Voltage Wiring" as used in Division 13 11 includes wiring  $\leq 24V$ . All Low Voltage Wiring is Provided with the Equipment. Low voltage wiring is shown in Low Voltage Wiring Diagram included in the pool drawings except where specified by Electrical Consultant.
6. The term "Control Wiring" as used in Division 13 11 refers to connections from individual equipment components to the Building Management System (BMS).

C. Applicable Code Permit and Inspection Responsibilities.

1. State and/or County Health Department permit fees by Owner.
2. Local Departments of Health inspection fees by Contractor.
3. Other permits/fees required paid by Contractor.
4. Scheduling of Required Inspections – Contractor
5. Documentation and Submission of accepted modifications to approved plans to Permit Authorities – Contractor.

D. Related Work Not in Division 13 11 Specified Elsewhere

1. Pool deck construction, including finishes, sealants, and drains.



2. Potable water or fresh water: Fresh water connection to auto fill and wastewater connections (see Contract Drawings).
3. Pool electrical work: Electrical connections shall be by the General Construction Contract Electrical Sub-Contractor. The Pool Contractor shall provide the filter pumps, motors, solenoids, relays, water level probes (with housing), motorized valves, etc., as shown on Contract Drawings and required by pool systems equipment manufacturer. The Electrical Contractor shall install and wire electrical equipment furnished by the Pool Contractor and shall provide motor starters and disconnect switches as indicated or required by Codes. The Electrical Contractor shall provide grounding and bonding per NEC Article 680.
4. Control Wiring for all electrical and HVAC equipment shall be by the control system sub-contractor.
5. Heating system for pools, heater by the Pool Contractor; venting and controls by Division 23.
6. Surge Tank Ventilation System
  - a. All surge tank equipment shall be purchased and installed by the Pool Contractor.
  - b. All surge tank ventilation and plumbing shall be purchased and installed by the Mechanical Contractor.
  - c. All plumbing shall be Schedule 40 PVC.
  - d. Pool Contractor to coordinate surge tank penetrations with Mechanical Contractor.
  - e. The Electrical Contractor shall provide all wiring, bonding, and grounding per NEC Article 680.

#### **1.06 QUALITY ASSURANCE**

- A. Qualifications of Pool Contractor:
  1. Work of Division 13 11 shall be performed by a Pool Contractor who has a minimum of five (5) projects with a proven five (5) year record of competence and experience in the construction of similar facilities of this size and complexity.
  2. Pool Contractor prequalification is required prior to bid. This must be received by the Architect fourteen (14) days prior to the bid date on the appropriate AIA form. (AIA A305)
  3. Pool Contractor shall meet all Local and State Certifications and License requirements prior to bidding. Copies of the required Certificates and Licenses shall be made available upon request.
- B. Performance Criteria: Certain sections of Division 13 11 contain performance criteria rather than product descriptions. It shall be the obligation of the Pool Contractor to ensure that all criteria are satisfied and the burden of proof of conformance shall rest with the Pool Contractor. The Architect/Engineer shall require complete calculations, past performance records and, if required, inspection trips of similar facilities to substantiate conformance with these criteria. The Architect/Engineer shall be sole judge of conformance, and the Pool Contractor is cautioned that he will be required to provide a finished product meeting all stated criteria and meeting or exceeding Department of Public Health requirements.
- C. All work of Division 13 11 shall be performed by the qualified Pool Contractor or a Subcontractor to the qualified Pool Contractor unless otherwise pre-approved in writing by the Architect/Engineer. A representative of the Pool Contractor shall oversee work subcontracted by the Pool Contractor.
- D. The following shall be performed during construction of the project.
  1. Refer to General Conditions, Division 01, and other Division 13 11 sections for further requirements.
  2. Competitive Racing Course Measurement Certification
    - a. The pool contractor shall provide the services of a registered engineer or land surveyor who shall measure and certify the length of the racing course for each lane and the elevations of the gutter lip at 10-foot centers. Course measurements shall meet tolerances set by World Aquatic standards.

#### **1.07 SUBMITTALS**

- A. Submittals Required
  - 1. Refer to General Conditions, Division 01, and individual Division 13 11 sections for number required.
  - 2. The Contractor shall submit for approval to the Architect/Engineer complete lists, including descriptions, catalogs, product cut sheets, etc., and where applicable dimensioned shop drawings of all material, fixtures, and equipment to be furnished and installed as part of Division 13 11.
  - 3. Submittals shall adequately and completely describe the equipment, including where necessary or requested complete construction and installation dimensions, complete capacity and performance data, all accessories and auxiliary equipment and all pertinent details of manufacture.
    - a. Submittals shall be provided in Adobe PDF electronic file format via email file size (10 MB max.). Create PDFs at native size and right-side up; illegible, partial, unlabeled, or unorganized submittal sections will be returned rejected. Contractor shall make their own copies from the original returned by the Architect.
- B. Product Data: Provide manufacturer's/installer's written installation instructions.
- C. Shop Drawings
  - 1. Myrtha Pool Shop Drawings.
  - 2. The drawings accompanying this Specification are diagrammatic in nature and show the general arrangement of all equipment, piping, ductwork, services, etc. Because of the small scale of the drawings, it is not possible to show all offsets, fittings and accessories that may be required. The Contractor shall carefully investigate the structural and finish conditions of his work and shall arrange such work accordingly; furnishing all fittings, pipe and accessories that may be required to meet such conditions. Where conditions necessitate a rearrangement, the Contractor shall obtain the Architect/Engineer's approval.
  - 3. Shop drawings for equipment shall be submitted, and Engineer's review of shop drawing shall be obtained before proceeding with fabrication. Shop drawings shall not be "doctored" reproductions of Architect/Engineer's drawings.
- D. Samples: Submit samples of materials, finishes, and trim as requested by the Architect/Engineer.
- E. Schedule of Values
  - 1. Provide Architect/Engineer with a copy of the Schedule of Values developed for this project relevant to Division 13 11 for approval.
- F. Valve Charts: Submit two (2) copies of valve charts for each piping system, consisting of Isometric Drawings or piping layouts showing and identifying each valve and describing its function to the Architect/Engineer for approval.
  - 1. Upon completion of the Work, one (1) copy of each chart sealed to rigid backboard with clear lacquer placed under glass and framed, shall be hung in a conspicuous location in the equipment room.
- G. Furnish to the Architect/Engineer the following:
  - 1. Refer to individual Division 13 11 sections for additional requirements.
  - 2. Submittals
    - a. Myrtha Pool Installation Qualifications and Certifications
    - b. Qualifications for "Swimming Pool Operator-Instructor (NSPF Certified Pool Operator, or equivalent certification)" as specified in 13 11 14, Part 3, 3.02, A.
    - c. Concrete Mix Design
    - d. Non-shrink Grouts
    - e. PVC and Pre-formed Plastic Adhesive Waterstop
    - f. Expansion/Construction Joint Materials
    - g. Caulking/Sealants
    - h. Pumps and Strainers

- i. Heater(s)
- j. Chemical Controller(s)
- k. Chemical Feeders
- l. Bulk Chemical Storage Tanks
- m. Valves
- n. Gauges
- o. Flow Meters
- p. Thermometers
- q. Pool Water Test Kit
- r. Inlets
- s. Grating
- t. Pre-fabricated Submerged Outlets
- u. Under Water Pool Lighting
- v. Deck Equipment
- w. Safety Equipment
- x. Maintenance Equipment
- y. Piping Materials (pipe, fittings, solvents, cements)
- z. Wall Sleeves and Seals for Piping
- aa. Tile Setting Materials and Joint Fillers
- 3. Shop Drawings
  - a. Reinforcing Steel
  - b. Water Activities
  - c. Filters
  - d. Myrtha Pool Shop Drawings
  - e. UV Disinfection System
  - f. Concrete Pump Pit & Surge Tank Penetration Drawings
- 4. Test Results
  - a. Water Treatment Analysis
  - b. Compaction
  - c. Piping Pressure Testing
- 5. Samples
  - a. Special Aggregate – Factory and Field Applied
  - b. Tile
  - c. Gratings
- 6. Guarantees/Warranties
  - a. Standard 1-Year
  - b. Standard 5-Year on Quartz Aggregate Finish
  - c. Standard 2-Year on Pool Finish Application
  - d. Special Equipment – Standard Manufacturer's Warranty
  - e. Future 3-Days of Instruction and Operational Checkout
  - f. Measurement Certification of Permanent Racing Course
- 7. Close Out Documents
  - a. O & M Manuals
  - b. Record Drawings
  - c. Owner's Certification of Instruction
  - d. Schedule for four (4) first season operation training follow-up sessions as noted in specification section 13 11 14, Part 3, 3.02, C.
  - e. Extra Materials

#### **1.08 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.
- B. Along with the Shop Drawings, the Contractor shall submit, in duplicate, a certificate properly attested, stating the material, equipment, and construction comply with the requirements of the

Contract Documents, for all equipment and materials proposed as a Substitute for the specified equipment and materials.

### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to General Requirements and Division 01 of the Specifications for additional requirements.
- B. Deliver all materials and equipment to the work site in original packages, fully identified with manufacturer's label. Store off ground and protect from weather with a suitable covering.
- C. Protect plastic pipe from exposure to chemicals (aromatic hydrocarbons, halogenated hydrocarbons and other esters and keytones) that might attack the material. Protect all pipes from mechanical damage and long exposure to sunlight during storage.

### **1.10 WARRANTIES**

- A. Warranty: Provide one (1) year warranty covering all pool workmanship, materials, and equipment. Refer to General Requirements and Division 01 of the Specifications for additional requirements.
- B. All standard manufacturer's warranties shall apply to all equipment and products provided by this Contractor.

## **PART 2 PRODUCTS**

### **2.01 NOT USED**

## **PART 3 EXECUTION**

### **3.01 EQUIPMENT BASES AND SUPPORTS**

- A. Provide for major equipment, reinforced concrete housekeeping bases poured directly on structural floor slabs (or as required by equipment manufacturer) 4 inches thick minimum; unless noted otherwise on plans, extended 4 inches beyond machinery bedplates. Provide templates, anchor bolts, vibration isolators, and accessories required for mounting and anchoring equipment. Anchorage system shall be in accordance with the equipment manufacturer's specifications and local code requirements. Consult with equipment manufacturer for length and installation of anchor bolts.

### **3.02 CLEAN UP AND PROTECTION**

- A. After work of Division 13 11 has been completed, cleanup work areas and remove all equipment, excess materials, and debris. Protect pool from damage until substantial completion. Remove and replace equipment and finishes that are chipped, cracked, abraded, improperly adhered, or otherwise damaged.
- B. At turnover to Owner, Contractor shall be responsible for, but not limited to, the following:
  - 1. Vacuuming and cleaning all pool floors, steps, and walls.
  - 2. Cleaning all depth marker tiles, pool tile and gutter grating.
  - 3. Cleaning and waxing of all pool deck equipment, water features and stainless-steel products per Manufacturer's instructions.
  - 4. See also Division 01 Specification requirements.

## **END SECTION**

**131114**  
**POOL START-UP, MAINTENANCE & OPERATIONS TRAINING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pool start-up and chemical balancing of water.
- B. Training of the Owner's personnel in pool operations procedures.

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 DESCRIPTION OF WORK**

- A. Water treatment and balancing.
- B. Operations and maintenance instruction and manuals.

**1.04 SUBMITTALS**

- A. Operations and Maintenance (O&M) Manual
  - 1. Pool Contractor shall deliver to the Architect/Engineer water sample location, analysis test results, SI calculation, and chemical adjustment calculations per Part 3.03.
  - 2. Pool Contractor shall deliver to the Architect/Engineer, bound together in a three-ring binder a complete manual, four (4) complete sets of operating and maintenance instructions for the swimming pool structure(s), finishes, and all component equipment. O&M Manual shall include, but is not limited to, the following:
    - a. Table of contents.
    - b. All equipment cut sheets.
    - c. Accurate parts lists.
    - d. Pool start-up, emptying, and winterization instructions.
    - e. Pool equipment commissioning certifications.
    - f. Pool and equipment operation and maintenance training certifications.
    - g. Pool cleaning instructions.
    - h. Pool maintenance requirements, divided into the following:
      - 1) Daily
      - 2) Weekly
      - 3) Monthly
      - 4) Seasonally
      - 5) Annually
    - i. Narrative on the pool operation through all sequences.
    - j. A DVD of complete start-up and shut-down procedures and training session.
    - k. Trouble shooting information and procedures.
    - l. A schematic of piping as installed.
    - m. Valve charts for each piping system, consisting of isometric drawings or piping layouts showing and identifying each valve and describing its function.
    - n. Copy of Measurement Certification of Permanent Racing Course
    - o. Record Drawings
    - p. Warranties

**PART 2 MATERIALS**

**2.01 NOT USED**

**PART 3 EXECUTION**

**3.01 EQUIPMENT START-UP & COMMISSIONING**

- A. Provide pool equipment start-up and commissioning services. See individual pool equipment specification sections and provide services in accordance with all specification requirements.

Provide Equipment Commissioning Certifications. Certifications to include date/s of commissioning activities, a summary of the commissioning work performed, signature of commissioning agent/s, and a Certification statement that equipment has been properly installed and commissioned per the manufacturer's requirements. Include copies of all equipment Commissioning Certifications in the Owner's Operation and Maintenance Manual, and as a Submittal to the Engineer/Architect.

### 3.02 OPERATIONS & MAINTENANCE INSTRUCTION

- A. Provide an experienced swimming pool operator-instructor (NSPF Certified Pool Operator, or equivalent certification) for a period of not less than three (3) days (two (2) full days operations and start-up, and one (1) full day shut-down assistance) after the pool has been filled and initially placed into operation.
  - 1. During this period, the Owner's designated representative(s) shall be thoroughly instructed in all phases of pool and pool equipment operation and maintenance (O&M).
  - 2. At a minimum, the swimming pool training and O&M Manuals must include the following:
    - a. General pool operations,
    - b. Pool materials and deck equipment maintenance,
    - c. Pool fill and operating water level
    - d. Pool/Equipment start-up, shut-down, emptying, and winterizing procedures.
    - e. Circulation pumping, pipe, fittings, valves, and ancillary equipment,
    - f. Filtration equipment,
    - g. Heating/cooling equipment,
    - h. Chemical treatment & monitoring systems,
    - i. Slide and water features
  - 3. Equipment training must be provided by the certified swimming pool operator-instructor and qualified equipment manufacturer representatives. See individual Specification sections for pool materials/equipment training and O&M requirements.
- B. Contractor shall obtain written certification from the Owner's designated representative acknowledging that all O&M instructions/training and materials have been provided. Certification shall include the detailed listing of equipment above with training completion and delivery dates, instructor contact information, and Owner representative's signatures.
- C. After the initial training noted in 13 11 14, Part 3, 3.02, A, include the cost of four (6) additional days/trips (minimum of 8 hours on site per day) of instruction and operational checkout/verification by an experienced swimming pool operator-instructor during the first year's operation. These four (4) additional days of training shall take place approximately 30 days, 90 days (2 days – 1 closing Pool C, 2<sup>nd</sup> review operation of Pool A and B), 6 months and 1 year (2 days – 1 opening 2nd season for Pool C, 2nd review operation of Pool A and B), after facility opening. Provide schedule to Owner as part of the project document closeout package. Written reports of each of these four (4) visits (5 days) outlining the pool's operation, competence and performance of the pool's operating personnel and other pertinent comments shall be submitted to the Owner and Architect/Engineer within one week after each visit.
- D. Provide a DVD documenting training and operational requirements, including start-up, emptying, and winterizing procedures.
- E. In addition to initial pool instruction listed, the Pool Contractor shall perform the first season pool closing (winterizing) and the following season pool start-up, including all labor and materials required. Specific to Pool C – Leisure Pool as noted above in 3.02, C.

### 3.03 WATER TREATMENT AND BALANCING

- A. Obtain a chemical analysis of the source/pool make-up water supply from a location as close as possible to the actual pool autofill. Conduct laboratory testing for the following parameters:
  - 1. Total Alkalinity [Parts per Million (ppm)]
  - 2. pH
  - 3. Calcium Hardness [ppm]
  - 4. Free Chlorine [ppm] & Combined Chlorine [ppm]

5. Total Dissolved Solids (TDS) [ppm]
  6. Iron (Must test to a lower detectable limit of  $\leq 0.05$  ppm)
  7. Manganese (Must test to a lower detectable limit of  $\leq 0.01$  ppm)
  8. Copper (Must test to a lower detectable limit of  $\leq 0.1$  ppm)
- B. The following are ideal ranges for the water analysis test results. If results fall outside these ranges the Contractor shall make chemical adjustments to the water during the pool filling process until values within the ideal ranges are obtained.
1. Total Alkalinity: 80-100 ppm (for high pH disinfectants) 100-120 ppm (for low pH disinfectants)
  2. pH: 7.4-7.6
  3. Calcium Hardness: 200-400 ppm (Pools), 150-250 ppm (Spas)
  4. Free Chlorine: 2.0-4.0 ppm & Combined Chlorine: 0.0-0.2 ppm
  5. Total Dissolved Solids: Acceptable Start-up Range is not applicable (Maintain future TDS levels to within 1200 ppm above the start-up measurement)
  6. Temperature: Ideal Range is  $\pm 2$  degrees F from the desired pool operating water temperature.
  7. Iron:  $\leq 0.05$  ppm
  8. Manganese:  $\leq 0.01$  ppm
  9. Copper:  $\leq 0.1$  ppm
- C. Contractor shall calculate the Langlier Saturation Index (LSI) using values from the water analysis. The formula for LSI is shown below. Calculations may be made easier using through use of Orenda Technologies Mobil App, or a similar calculator. The LSI values shall fall within an acceptable "balanced" range of -0.3 to +0.3. If the LSI is outside this range OR test values are outside the ideal range listed above, the Pool Contractor shall prepare to add chemicals to the pool water volume as required until all parameters are within the ideal ranges previously listed, and the LSI is considered "balanced", Contractor is responsible for calculating required chemical additions and for adding all adjustment chemicals up until the time of project completion. Owner is responsible for providing the chemicals.

LSI Equation:

$$(\text{pH}) + (\text{Temperature } ^\circ\text{F}) + (\text{Calcium Hardness}) + [(\text{Total Alkalinity}) - (\text{CYA correction factor @ current pH})] - (\text{TDS factor}) = \text{LSI}$$

**Equivalent Factors - Langelier Saturation Index (LSI)**

Temperature (°F)	Temperature Factor	Calcium Hardness (PPM)	Calcium Hardness Factor	Alkalinity (PPM)	Alkalinity Factor	Cyanuric Acid (if present)	Cyanurate Correction Factor	Total Dissolved Solids	TDS Factor
32	0.0	5	0.3	5	0.7	pH	Factor	< 1000 ppm	12.10
37	0.1	25	1.0	25	1.4	7.0	0.23	1000 ppm	12.19
46	0.2	50	1.3	50	1.7	7.2	0.27	2000 ppm	12.29
53	0.3	75	1.5	75	1.9	7.4	0.31	3000 ppm	12.35
60	0.4	100	1.6	100	2.0	7.6	0.33	4000 ppm	12.41
66	0.5	150	1.8	150	2.2	7.8	0.35		
76	0.6	200	1.9	200	2.3	8.0	0.36		
84	0.7	300	2.1	300	2.5	Note: Only use if CYA is used in your pool. Only applies to >7.0pH. If so, select correction factor based on pool pH.		Note: most calculators assume 12.1 for under 1000ppm, or 12.2 for anything over 1000.	
94	0.8	400	2.2	500	2.6				
105	0.9	800	2.5	800	2.9				

- D. Contractor shall provide a submittal to the Engineer/Architect after receiving the water analysis. Submittal shall include the following:
1. Water sample location and analysis test results,

2. SI Calculation,
3. Chemical adjustment calculations indicating the following:
  - a. Pool Volume
  - b. Chemical Parameters requiring adjustment
  - c. Chemicals required to make the adjustments
  - d. Calculations showing amounts of each chemical addition that is required
- E. Contractor shall provide list of required balancing chemicals with quantities to the Owner for Owner purchase immediately after receiving the approved submittal from the Engineer/Architect.
- F. The Owner shall be responsible for payment of water required to fill each pool one time for leak testing and a second time for the final pool start-up process. The Contractor shall be responsible for payment of any additional water and chemicals required due to draining and refilling of pools as needed for pool or pool piping repairs.
- G. Contractor shall make chemical adjustments to the pool water during the pool startup process based on calculations provided in the approved submittal. It is critical to keep the pool water clean and balanced during the initial fill and while the pool plaster finish is curing. Follow all recommendations of the National Pool Plasterers Council for initial adjustments required during the plaster cure time. See additional requirements in Pool Finish Specification Section/s.
- H. Stabilize pool water to within a range of 5 to 15 ppm maximum of cyanuric acid.
- I. Heat pool water to within 5 degrees Fahrenheit of the desired pool operating temperature. Once this temperature is attained, the Pool Contractor shall enter the chemical controller settings for all chemical parameters. Do not enter chemical controller settings prior to reaching the desired pool operating temperature range.

**END SECTION**



**131117**  
**PREFABRICATED SWIMMING POOL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The Myrtha Pools on this project will be Owner furnished - Contractor installed.
- B. This section includes the following:
  - 1. Prefabricated Wall System
  - 2. Prefabricated Gutter System
  - 3. Prefabricated Inwall Steps
  - 4. Prefabricated Bottom Drains
  - 5. PVC Floor Underlayments
    - a. PEM (Soft Floor)
    - b. Fleece
  - 6. PVC Floor Membrane
    - a. Alkor200
    - b. Alkor Evolution
    - c. Alkor200 Anti-slip
  - 7. Inlets for prefabricated swimming pools
    - a. Wall
    - b. Floor
  - 8. Accessories for prefabricated swimming pools
    - a. Floating Line Anchors
    - b. Lane Markings
    - c. Wall Targets

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.
- B. Consult with Owner/Myrtha to receive the most up to date Myrtha Materials List and Exclusion for the Myrtha Pool systems specific to this project.

**1.03 USE OF SITE**

- A. General
  - 1. The contractor will restrict his construction to the general area shown on the drawings.
  - 2. Access and egress shall be coordinated with the general contractor and controlled so as not to conflict with the normal operations of the project.
- B. Design
  - 1. The design shown on the drawings shows the intended use, shape and desired locations of the elements in relation to the adjacent deck uses.
  - 2. The prefabricated pool manufacturer shall indemnify and hold harmless the architect and the owner from any and all actions caused by or related to the design, fabrication and installation of the work of this specification section.

**1.04 DESCRIPTION OF WORK**

- A. General
  - 1. Owner shall be responsible for:
    - a. Full purchase and delivery of all Myrth materials.
  - 2. Myrtha Manufacturing shall be responsible for:
    - a. All items noted for specification of materials and design noted within this specification (13 11 17)
    - b. Furnish/Deliver all parts and materials necessary to complete installation of all three pools per plan documents.

3. Contractor shall be responsible for (but not limited to):
    - a. Coordinate and submit Myrtha Shop Drawing submittals for engineering team review.
    - b. Coordinate the delivery schedule with Myrtha for all Myrtha materials.
    - c. Provide labor and equipment to perform the “live unloading” of all Myrtha parts and materials and safe storage on site.
    - d. Review and inventory of all Myrtha parts and materials delivered to the project site.
    - e. Verify all materials have been delivered whole and without damage.
    - f. Complete installation of Myrtha parts and materials, providing working pool systems with no leaks.
  4. Provide basis of design Prefabricated Swimming Pool Manufacturer’s standard and/or custom components and assemblies integrated into a complete system that form a pool capable of withstanding imposed structural loads, thermally imposed movement, and deterioration from weather, site, and service conditions at a minimum as specified in this section
  5. The prefabricated pool manufacturer, in providing its bid, warrants that it is licensed to do work in the project’s state and municipality and holds appropriate professional registrations, permits and/or meets other requirements by authorities having jurisdiction.
  6. Delegated Design: The prefabricated swimming pool manufacturer is responsible for a project site-specific design of the prefabricated pool elements as outlined herein. See ‘Delegated Design’ definition in Specifications Section 13 11 13 POOL GENERAL.
- B. Structural Performance
1. Provide wall panels, structural supports, structural connections capable of withstanding the effects of soil (backfill) pressures, hydrostatic, and other applicable loads and resulting stresses within the limits without leakage and under the conditions indicated. **Design conditions must include analysis for the pool when in operation (completely full of water) and in an empty condition after backfill and deck installation.**
  2. Lateral Backfill Loads:
    - a. Include lateral loads including lateral soil pressure, pool decks, other significant adjacent structures, and overburden created by compaction efforts performed in conformance with compaction techniques specified in this section.
  3. Hydrostatic Loads
    - a. Include lateral loads induced by the presence of water within the pool.
  4. Lateral Live Loads
    - a. Include loads induced by contact of swimmers with the structure under intended use conditions.
  5. Seismic Loads
    - a. Include lateral loads that may be induced into the structure from seismic activity. Consult project specific applicable building codes and geotechnical information as required.
  6. Load Combinations
    - a. Design pool system to withstand the following load combinations:
      - 1) Lateral Backfill
      - 2) Hydrostatic
      - 3) Hydrostatic + Lateral Backfill + Lateral Live
      - 4) Hydrostatic + Lateral Backfill + Lateral Live + Seismic
  7. Deflection Limits
    - a. Design assemblies to withstand design loads with deflections no greater than the following
      - 1) Deflections listed are per typical design. If lesser deflection is required, please consult Prefabricated Swimming Pool Manufacturer for feasibility assessment.
      - 2) Structural Bracing: Horizontal deflection of 1/250 of the height, not to exceed 4mm.
- C. Water Penetration for wall and floor Systems

1. Provide wall and floor assemblies manufactured and installed with no water penetration (leakage) through the system(s). PVC shall be continuous across connections between wall panels, between wall panels and floor membrane, and across joints between sections of floor membrane.

D. Definitions

1. Base Frame
  - a. Structural steel member bolted to bottom panel flange and concrete foundation designed to provide adjustable interface between wall panels and concrete foundation.
2. Bottom Drain
  - a. Drain typically placed at lowest portions of pool typically used to drain the pool but may also be used in conjunction with filtration. Often termed 'Main Drain'.
3. Buttress
  - a. Structural steel member bolted to panel support or base frame and foundation designed to transfer applied loads to the foundation.
4. Floating Line Anchor
  - a. Steel component at pool perimeter used to secure the ends of floating lines. May be one of several available types depending on pool design.
5. Floor Underlayment
  - a. Material placed between the foundation and the PVC floor membrane, which may be designed to cushion the floor, buffer imperfections in the floor finish, provide a sub-membrane drainage layer, etc.
6. Gutter
  - a. Component of wall system designed to convey water from the pool along its perimeter to the filtration system.
7. Gutter Mounted
  - a. An accessory supported by steel brackets attached to the gutter system designed to reduce the need for deck equipment. May consist of handrails, line anchors, stanchion sockets, or other accessories.
8. Inlet
  - a. Water distribution device located at finished pool wall or floor used to distribute water from filtration system into the pool.
9. Liquid PVC
  - a. PVC dissolved in a solution that, when exposed to air, will bond to PVC and harden to form a seal.
10. Panel Support
  - a. Steel member bolted to the wall panels at panel seams.
11. Primary Components
  - a. Structural or critical elements of pool assembly.
  - b. Primary components include, but are not necessarily limited to, base frames, wall panels, panel supports, buttresses, gutters, and gutter supports, concrete anchors, and PVC membrane.
12. PVC Membrane
  - a. Flexible sheet PVC of typically small thickness formed into rolls for use in various applications.
13. PVC Rope
  - a. Strips of PVC used in conjunction with a heat welding process to provide a primary seal in many applications.
14. PVC Cold Weld
  - a. Process of bonding two stainless steel panels together providing a watertight seal.
15. PVC Welding

- a. Process of bonding two or more PVC elements by using a special heat tool to melt adjacent layers of PVC then applying pressure to allow the melted layers to bond and cool.
16. Secondary Components
  - a. Less critical elements of pool assembly and fasteners.
  - b. Secondary components include, but are not necessarily limited to, fasteners, accessories, grilles, PVC sealants and seaming materials, and tile and tile components.
17. Structural Supports
  - a. Base Frames, panel supports, buttresses, etc. designed to provide structural stability to wall system.
18. Wall Panels
  - a. Fabricated sheet steel components, which when properly connected and supported, provide pool wall surface and waterproofing.

### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized experience in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer and the following:
  1. Has successfully completed five (5) projects similar in type.
    - a. Exception: In lieu of the required number of projects, installer may engage one or more manufacturer-endorsed master installers with a minimum completion of 20 successful projects similar in type.
  2. Qualification of Workmen: At least one (1) person who is thoroughly familiar with the materials, methods and equipment being utilized shall be present at all times during the construction to direct the work where required.
- B. Manufacturer Qualifications
  1. A firm experienced in manufacturing pools similar to those indicated for this Project and with a record of successful in-service performance.
  2. Has successfully manufactured a minimum of 30 projects with a minimum of 50 bodies of water which have been installed within the past 5 (five) years.
- C. ISO Registration
  1. Firm shall provide ISO 9001 (or better) certificate or provide evidence of successful-audited QA/QC program.
  2. Manufacturer shall present certificate of ISO 9001 (or better) registration or the following:
    - a. Manufacturer will employ an independent testing agency chosen by Contractor to perform source quality-control testing and special inspections, and to prepare test reports.
      - 1) Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
      - 2) Manufacturer shall allow testing agency access to places where structural/primary components are being fabricated or produced and cooperate with testing agency and provide samples of materials as may be requested for additional testing and evaluation.
    - b. Manufacturer shall correct deficiencies in or remove and replace primary components that inspections and test reports indicate do not comply with requirements.
    - c. Additional testing, at manufacturer's expense, will be performed to determine compliance of corrected Work with requirements.
    - d. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Engineering Responsibility
  1. Preparation of detailed prefabricated pool Shop Drawings, testing program development, test result interpretation, and comprehensive project site-specific engineering analysis by a qualified professional engineer.

2. Prefabricated pool shop drawings shall be signed and sealed by a qualified professional engineer registered in the State or Province of the project location. If required by the local authority having jurisdiction, the signed and sealed drawings shall be provided for permit approval/review.
- E. Source Limitations
  1. Obtain all prefabricated pool systems through one source from a single manufacturer.
- F. Product Options
  1. The overall appearance of the pool is obtained through specific information such as overall geometry, components, colors, materials, and performance characteristics as provided on drawings and specifications. The evaluation of completed construction is subject to inspection for purposes of verification by reasonable methods including, but not limited to, post manufacture testing, field testing, and/or performance evaluation.
- G. Aesthetic Effects
  1. Do not modify intended aesthetic effects, as judged by Architect or aquatic consultant, except with Architect or aquatic consultant's written approval.
  2. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- H. Pre-Installation Meeting
  1. Conduct meeting to comply with requirements in Division 1.
  2. Meeting shall include a design/engineering/construction representative from all parties responsible for the prefabricated pool, pool foundations, pool plumbing, and pool earthwork/backfilling.
  3. Agenda shall be provided by the prefabricated pool supplier and installer in advance of meeting and shared with the attendees. Meeting minutes shall be recorded and distributed per Division 1 requirements.

#### 1.06 SUBMITTALS

- A. Submittals Required
  1. Refer to General Requirements and Division 01.
  2. Product Data: Include material descriptions, performance characteristics, and finishes for each type of the following system components.
    - a. Wall Panels
    - b. Radius Wall Panels
    - c. Finger Wall
    - d. Structural Supports
    - e. Gutters
    - f. Connections & Interface Components
    - g. Drains
    - h. Inlets
    - i. Floor Underlayments
    - j. Floor Membrane
    - k. Accessories
    - l. Leak Test Calculations/Results and Repair Documentation
- B. Shop Drawings:
  1. Promptly after the contract award, the contractor shall submit complete engineered shop drawings to include, but not be limited to:
    - a. Plans indicating the type of system & structural components and the type, location, and quantity of accessories provided.
    - b. Pool wall layout with dimensions, overlaid with contract pool design, identifying deviations from the design required for fabrication.
    - c. Prefabricated pool component details.
    - d. Wall structural support and anchoring system.

- e. Foundation elevations, dimensions and modifications as required for prefabricated pool.
    - f. Piping connections and converters.
    - g. Modifications to deck design, if any, shall be identified to the architect and Aquatic Designer required for review and coordination with deck contractor and deck designer.
  2. All shop drawings shall be certified and sealed by an engineer, registered and licensed in the project state.
- C. Samples
  1. For the following items, provide brochures, product cut sheets or sample components. Prepare samples from the same material to be used for the work.
    - a. Wall Panels
    - b. Exposed Membrane (each type)
    - c. Exposed PVC Profiles
    - d. Tile (Single tiles, or single sheets for mosaics)
    - e. Exposed Grilles and Grates
- D. Product Certificates
  1. Provide a product certificate signed by manufacturer of pool system certifying that all products furnished comply with contract documents and requirements.
- E. Engineering Reports
  1. If requested by Architect/Engineer, manufacturer shall provide static calculations and loads specific to the panel assembly. Calculations shall be sealed by a professional engineer licensed in the project's jurisdiction.
- F. Installer Certificate
  1. Provide an installer certificate, signed by manufacturer certifying that installation contractor complies with the installer quality assurance requirements contained herein.
- G. Manufacturer Certificate
  1. Provide a manufacturer's certificate, signed by manufacturer certifying that they comply with the quality assurance requirements contained herein.
- H. Project References
  1. Provide five (5) references including project location, description of facility and bodies of water manufactured, and representative photographs.
- I. Qualification Data
  1. For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Provide a list of completed projects with project names and addresses, and addresses of architects and owners, and other information specified.
- J. Warranty Certificate
  1. Manufacturer shall submit warranty certificate.

#### **1.07 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to General Requirements and Division 01.
- B. Packaging
  1. Deliver components and other manufactured items so as not to be damaged or deformed.
  2. Package small components together in crates or containers to prevent loss of small items.
  3. Package hazardous and/or sensitive materials together and clearly labeled to indicate use of caution or extra attention is required.
  4. Finished panels shall be covered with continuously applied adhesive-fixed protective layer to prevent damage to panel surface.

5. Bundle and secure components to prevent scattering and damage to other materials during shipment.
- C. Storage
1. All pool components shall be stored and staged with sufficient site safety and security to ensure damage or losses from vandalism, theft, and weather do not occur.
  2. Stack non-structural materials on platforms or pallets, covered with tarpaulins or other suitable weather tight and ventilated covering. Store underlayment and boxed items to ensure dryness. Do not store wall panels, PVC membrane, PVC profiles, or other soft-finish items in contact with other materials that might cause staining, denting, or other surface damage, or in direct sunlight.
  3. Store hazardous materials as follows:
    - a. Store in a climate-controlled environment within temperature ranges specified by product manufacturer
    - b. Keep out of direct sunlight
    - c. Store away from open flame or sources of heat
    - d. Comply with applicable safety regulations governing hazardous material storage and handling.
- D. Handling
1. Unload, store, and erect manufactured pool components to prevent bending, warping, twisting, and surface damage.

#### **1.09 WARRANTIES**

- A. General Warranty
1. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty on Prefabricated Pool System
1. All work of this section shall be warranted against all defects of material and installation for a period of one (1) year from date of acceptance. Any failures that may occur within this warranty period, due to defective installation and/or materials, shall upon written notification of such failure be repaired or replaced in a timely manner.
  2. Written warranty executed by manufacturer agreeing to repair or replace pool system components provided by manufacturer that have failed and/or directly result in leakage of the pool.
  3. The Warranty Period shall be provided as follows:
    - a. Watertightness for (10) years
    - b. Structural integrity for (25) twenty-five years
    - c. Plastic grille structural integrity-one year, (see manufactures warranty).
  4. All Warranties shall commence on the date of substantial completion.

#### **1.10 MANUFACTURER TERMS OF AGREEMENT**

- A. General
1. A deposit to the prefabricated swimming pool manufacturer may be required prior to initiate shop drawings and material fabrication. Prior to placing the Bid, Contractor shall coordinate and confirm understanding of these deposit and payment terms with the prefabricated swimming pool manufacturer.
  2. Contractors failure to coordinate terms and conditions with the Prefabricated Swimming Pool Manufacturer shall not constitute a valid cause for delay of submittals, shop drawings or material delivery.
  3. Prior to placing Bid, Contractor shall also coordinate and confirm understanding of all other terms of agreement with the prefabricated swimming pool manufacturer. This includes but is not be limited to warranties, scope of material supply, scope of installation, scheduling, material shipment, and material unloading requirements.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Subject to compliance with requirements, provide products by the following manufacturer,
  - 1. Myrtha Pools (Commercial Division of A&T Europe, S.p.A)

### **2.02 STRUCTURAL COMPONENTS**

- A. Primary components shall be fabricated by cold working from either AISI 304/L or 316/L or 441 stainless steel sheet or standard shapes.
- B. Secondary components shall be grade AISI 304 stainless steel (minimum) and may be fabricated by hot-working as required.
- C. Anchor Rods, Bolts, Nuts, and Washers
  - 1. Grade AISI 304 stainless steel minimum.
- D. Chemical Anchors
  - 1. Chemical anchor capsules in accordance with ASTM E 1512.

### **2.03 PVC COATED STEEL MATERIALS**

- A. Stainless Steel Sheet: Grade AISI 304/L or 316/L or 441 stainless steel.
- B. PVC-Coated Stainless Steel Plate
  - 1. All PVC coated stainless steel components shall be constructed from PVC coated stainless steel sheet (or blanks) manufactured by hot calendaring PVC to the stainless steel sheet. The bonded PVC shall withstand tensile (de-lamination) force of 27 lb on a sample if 1" at 180° angle de-lamination.

### **2.04 PVC MEMBRANE**

- A. Floor Membrane
  - 1. PVC floor membrane shall be a reinforced PVC geo-membrane (chemically coated fabric) with the following properties:
    - a. Minimum thickness of 1.5mm in accordance with ASTM D 374.
    - b. Minimum resistance to tearing of 90 lb/90 lb in accordance with ASTM D 1004.
    - c. Minimum resistance to peeling of 130/130 N/mm in accordance with ASTM D 638

### **2.05 GENERAL FABRICATION**

- A. Design components and field connections required for erection to permit easy assembly.
  - 1. Mark a minimum of one of each part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
  - 2. Fabricate elements to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Cold-formed members shall be free of cracks, tears, and ruptures.
- B. Primary Components
  - 1. Shop-fabricate all aspects of primary structural components and panels.
  - 2. Punch/bend all elements including punching of holes for filtration components, through-panel fasteners, lights and accessories, bolted connections and bending of flanges for bolted connections and recesses.
  - 3. Field cutting/modification of primary components is not permitted.

### **2.06 STRUCTURAL SYSTEM**

- A. Structural Elements
  - 1. Manufacturer's standard structural primary system, designed to withstand required loads and specified requirements.
  - 2. Primary system includes base frame, wall panels, panel supports, buttresses, gutter supports and gutters.
  - 3. Provide structural elements with required splice members. Factory drill or punch for field-bolted assembly.



- a. Slight variations in pool depth, locations of accessories, and locations of change in floor slope may be acceptable if necessary to meet manufacturer's standard, as approved by Architect/Engineer.
4. Base Frames
  - a. 'C'-shaped sections fabricated from cold-worked steel (14ga (2mm) steel sheet minimum).
  - b. Frame construction shall ensure tight horizontal tolerance and allow for vertical adjustment to compensate for variations in finished concrete.
- B. Wall Panels
  1. Panels fabricated from cold-worked PVC laminated steel (14ga (2mm) steel sheet minimum).
  2. Panel construction shall provide for flanged-bolted connections with compatible steel with no through-panel fasteners below tile line.
  3. Flange bolt spacing shall not exceed 6" without utilizing flange stiffening element.
  4. Wall panels will have a protective plastic film on the interior face (water side) of the panel that will be removed during the installation process before the pool is filled with water.
  5. Wall panels will have a clear, protective coating applied to the exterior face to provide a permanent shield against oxidation from chlorinated atmosphere.
- C. Panel Supports
  1. Panel supports fabricated from cold-worked steel (14ga (2mm) steel sheet minimum). Flanges, connection plates, and stiffening elements shall be fabricated by cold-working (no steel welding is permitted).
- D. Buttresses
  1. Structural braces fabricated from 14ga (2mm) steel sheet minimum. In lieu of fabrication from cold-worked sheet, buttresses may be fabricated from hot or cold formed standard angle, c, zee or other standard section provided all additional flanges, connection plates, and stiffening elements are fabricated by cold-working (no steel welding is permitted).
- E. Gutter Supports
  1. Brackets fabricated from cold-worked steel (14ga (2mm) steel sheet minimum). Gutter supports shall be fabricated integrally with panel supports or separately provided gutter support construction provides for bolted connection to panel supports.
- F. Gutter
  1. Channels fabricated from cold-worked PVC laminated steel (14ga (1.5mm) steel sheet minimum).
  2. Gutter construction shall provide for flanged-bolted connections with compatible steel between gutter segments.
  3. Gutter splice plates are not permitted.
  4. Gutters/gutter supports for tile finished gutters shall be constructed with permanent adjustment system to level gutter at skim line prior to installation of tile (floating of tile on gutter or adjustment of coping over 1/8" to obtain level skim is not permitted).
  5. Gutters will have a protective plastic film on the interior face (water side) of the gutter that will be removed during the installation process before the pool is filled with water.
  6. Gutters will have a clear, protective coating applied to the exterior face to provide a permanent shield against oxidation from chlorinated atmosphere.
- G. Gutter Drain Flanges
  1. Flanges fabricated from hot or cold formed steel.
  2. Flanges may be secured to gutter or gutter drain manifold by steel welding.
  3. Flanges shall be fabricated to connect to standard PVC flanges.
  4. Gutter drains placed in accordance with the architect's/engineer's drawings.
  5. No flanges in the gutters are permitted; this would obstruct the free flowing of water into the drain.
- H. Structural Anchoring

1. Provide anchoring to foundation as follows:
  - a. Rods: AISI 304 Stainless Steel in Epoxy filled holes in accordance with anchor manufacturer's written instruction.
- I. Connection Hardware
  1. Provide stainless steel bolts, nuts, washers, screws, etc. for fasteners in permanent contact with stainless steel elements, whether through head contact or by penetration through the steel. Bolts/nuts shall be fabricated to prevent seizing (standard bolts with field-applied anti-seize solution are not acceptable).

## 2.07 ACCESSORIES

- A. Line Anchors
  1. Shall be designed and fabricated to withstand forces specified by floating line manufacturer or by recognized swimming authority.
  2. Line anchor secured only to wall panels are not permitted.
- B. Gutter Mounted Elements
  1. Shall be designed and fabricated to withstand forces specified by accessory manufacturer and/or recognized swimming authority in addition to those service conditions specified by governing code officials.
  2. Exposed steel shall be polished stainless steel, to a minimum 500 grit.
- C. Bottom Drains
  1. Provide suction outlet fitting assemblies as scheduled on the drawings.
  2. Suction outlet fitting assemblies shall be tested and certified to ~~ASME A112.19.8-2007~~ and APSP 16-2017.
  3. Drains shall be designed and fabricated to facilitate monolithic concrete slab or block-out type installations and concrete bonding.
- D. Gutter Grating/Grilles
  1. Grilles fabricated in multiple-interchangeable segments.
  2. Grilles shall be fabricated with buffers or slats parallel to pool edge to limit deck splash-over.
  3. Grating design shall meet ASTM D790-10 or ANSI/AS3996 Class A for covers and grates with load exceeding 10kN (2,248lb).
- E. PEM (Soft Floor Mesh)
  1. PVC mesh [Poly Extruded Matting] shall be a heat and pressure bonded, non-woven, flexible plastic material with superior tear strength (350psi: ASTM D-624-91), low brittleness in cold weather climates (ASTM D-746-79), significant tensile strength (2190psi: ASTM D-412-92) and contain admixtures to prevent microbial growth.
  2. PVC mesh shall provide a fall attenuation of 3 feet as standard, unless otherwise indicated on the Contract Drawings.

## PART 3 EXECUTION

### 3.01 COORDINATION

- A. Coordinate size and location of concrete footings, stem walls, and floors. Concrete, reinforcement, and formwork requirements are specified in Division 13 Section "Pool Concrete." Alert architect/engineer to discrepancies between contract drawings and requirements for proper pool wall panel support.
- B. Facilitate storage and staging of hazardous and non-hazardous materials in conformance with 'Delivery Storage & Handling' requirements.

### 3.02 PROJECT CONDITIONS

- A. Site Conditions
  1. Installation contractor shall confirm in writing suitability of project site to proceed with installation. Confirm the following items, including but not limited to:
    - a. Accessibility to pool area.

- b. Safety of pool excavation.
  - c. Dimensions of pool foundation and floor. See 3.02E.
- B. Weather Limitations
  - 1. Proceed with installation only when weather conditions permit installation according to manufacturer's written instructions and warranty requirements. Various phases of installation may have differing requirements.
- C. Field Measurements
  - 1. Prior to commencement of installation, site conditions shall be approved in writing by installation contractor as specified in Section 3.01 COORDINATION. As projects may be phased, installation contractor shall only approve those portions of the project ready for pool installation.
- D. Concrete Surfaces
  - 1. At all times protect concrete floor from oil, paint, solvents, and other items that may damage PVC membranes. Notify the installation contractor and manufacturer in writing if such items do come in contact with concrete floor. Remedy floor contamination as required by manufacturer at Contractor's expense.
- E. Field Measurements
  - 1. Construction of the pool foundation and floor shall be coordinated and confirmed as follows:
    - a. Conduct a survey of the formwork for the foundation for the complete pool system (including footings and floor slab) by a qualified independent surveyor. Provide a drawing and/or report of survey findings for review. Along with other applicable information, provide a statement of compliance with construction documents. Surveyor shall specifically consider the following:
      - 1) World and relative placement of pool foundation
      - 2) Vertical and horizontal line
      - 3) Elevation
      - 4) Allowable construction tolerance
- F. Survey
  - 1. Upon completion of the concrete pool foundation, provide a final survey by installation contractor.
  - 2. A drawing and/or report of their findings shall be submitted for review.
  - 3. Deficiencies in any of the areas listed below shall be identified along with other applicable information.
  - 4. Provide recommendations for correction of deficient conditions and advise of possible delays and additional costs that may result as soon as possible, specifically considering the following:
    - a. World and relative placement of pool foundation
    - b. Horizontal line
    - c. Elevation
    - d. Concrete finish

### **3.03 PREPARATIONS**

- A. Clean Concrete as follows:
  - 1. Remove dirt and mud from concrete floor.
  - 2. Remove, clean, and treat oil, paint, and solvents per manufacturer's recommendations as required.

### **3.04 PREFABRICATED SWIMMING POOL INSTALLATION**

- A. Install pool system according to manufacturer's written instructions and installation drawings.
- B. Install grounding for steel components according to applicable articles and governing codes.

- C. Prior to component installation, inspect all primary components for damage or defect. Do not install damaged or defective components. Notify pool manufacturer immediately of any damaged or defective components.
- D. Do not field cut, drill, or alter primary members without written approval from pool system manufacturer.
- E. Set primary and secondary components in locations and to elevations indicated and according to manufacturer's written specification. Maintain structural stability of pool during installation.
- F. Base Frame
  - 1. Connect all base frame elements and set into position prior to leveling to ensure all components are manufactured to the required overall dimensions.
  - 2. For straight wall pools, attach base frame to concrete as required to ensure both finished line and elevation are maintained throughout installation.
  - 3. For radius walls, install elevation adjusting bolts after installing wall panels. Do not permanently fix base frame to concrete until all primary components are connected.
- G. Wall Panels, Panel Supports, Buttresses, and Gutter Supports.
  - 1. Stage wall panels as required around pool perimeter to protect panel surface at all times.
  - 2. Remove protective panel covering from connecting flanges to prevent covering from being trapped between connecting flanges.
  - 3. Connect wall panels to base frame, panel supports and adjacent wall panels per manufacturer's recommendations with as few bolts as required to prevent gapping between panels.
  - 4. Connect buttresses to panel supports and panel supports to foundation to ensure walls are properly braced during installation.
  - 5. After wall segments are installed from end-to-end, install remaining fasteners and tighten per manufacturer's recommendations.
  - 6. Perform final adjustment of wall verticality (and horizontal line if necessary).
  - 7. Final tighten anchors.
- H. Gutters & Gutter Supports
  - 1. Connect remaining gutter supports to panel supports.
  - 2. Attach gutter segments to wall panels/gutter supports/adjacent gutter segments per manufacturer's recommendations with as few bolts as required to prevent gapping between gutter segments.
  - 3. Final tighten gutter segment-to-gutter segment flanges.
  - 4. Final tighten remaining fasteners.
  - 5. For curved wall pools, once all primary elements are connected and tightened, adjust base frame elevation adjusting bolts to level pool structure. Level should be measured from tile recess. Once structure is level and plumb, spot measurements from the finished pool line to the traced pool line should be recorded. Contractor must be informed in writing of line deviations in excess of 25mm (1"). Once line is confirmed, the base frame should be anchored to foundation as required.
  - 6. Adjust all skimming sections of gutters to constant water level.

### **3.05 WALL PANEL SEALING**

- A. General
  - 1. Install uniform-watertight PVC seals.
  - 2. Perform wall panel sealing according to manufacturer's written instructions.
  - 3. Apply mechanical (welded PVC) and chemical seals within temperature and climatic ranges specified by manufacturer.
- B. Mechanical Seals
  - 1. Clean and rinse surfaces of dirt, dust, debris, and adhesive film by scrubbing with a lightly abrasive fabric or cloth and a mild detergent.
  - 2. Install PVC rods and/or strips to minimize joints and splices.

3. Weld rods and strips to panel to ensure good bond, free of exposed scorching, and free of substrate blisters and wrinkles.
4. Chemically seal exposed edges of strips and rods as specified in the following item 3.04.D 'Chemical Seals'.

C. Chemical Seals

1. Clean and rinse surfaces of dirt, dust, debris, and adhesive film by scrubbing with a lightly abrasive fabric or cloth and a mild detergent.
2. Avoid application of harsh chemicals and primers on exposed-finished PVC.
3. Ensure substrate remains dry throughout application and curing of chemical seal.
4. Apply liquid PVC in thin layers to prevent forming of bubbles in curing PVC. Final installation shall be free of bubbles.

**3.06 PVC MEMBRANE INSTALLATION**

- A. Install membrane according to manufacturer's written instructions and installation drawings.
- B. Prior to permanent fixing or welding, PVC membrane shall be inspected for visible defects or blemishes. Do not install damaged or defective membrane. Notify pool manufacturer immediately of any damaged or defective membrane.
- C. PVC membrane shall be stretched both longitudinally and transversely to prevent wrinkles from forming. Wrinkled PVC membrane shall be removed and replaced.
- D. Seams
  1. All seams in membrane and connections between membrane and wall panels shall be heat continuously welded a minimum of 38mm (1½"). Heat welding devices explicitly designed for PVC membrane welding shall be utilized for welding. Welds shall be spot checked per manufacturer's written instruction prior to final seam sealing.
  2. PVC weld seams shall not extend into flanged accessory connections. Utilize secondary PVC section to provide uniform surface for flanged connections.
  3. Exposed PVC membrane edges shall be sealed with liquid PVC or by heat sealing according to manufacturer's written instructions.

**3.07 ACCESSORIES INSTALLATION**

- A. General
  1. Install accessories according to accessory manufacturer and pool manufacturer's written instructions and installation drawings and install grounding for steel accessories according to applicable articles and governing codes.
- B. Underwater Lights
  1. Install light niches prior to pool backfill.
  2. Light gaskets shall be in good condition and without permanent deformation. For niches with counter-flange and pool-side flange, install gaskets between niche counter-flange and panel and between flange and panel.
  3. Install electrical components/grounding according to applicable articles and governing codes.
- C. Floor Inlets
  1. Remove screws, cover plates, flanges, and gaskets and store well-marked in secure location.
  2. Setting
    - a. Floor inlets cast into concrete in original foundation pour shall be protected by durable means to prevent damage to inlet body. Install protection immediately upon installation of inlet and leave in place until flanges are installed.
    - b. Set inlets as required to flush flange of inlet with finished top surface of PVC floor membrane. Setting may require recessing floor inlet in concrete for floors with no underlayment.
  3. Securing

- a. For floor inlets positioned on concrete floors with slope in excess of 5 degrees (approx. 1:12), do not cut floor membrane for inlet until water is filled within 2' (horizontal) of inlet to prevent wrinkles from forming near floor inlet.
  - b. For floor inlets in line with floor membrane seams, install PVC membrane ring having a minimum radius of 62mm (2½") greater than the inlet flange radius (flange diameter +124mm [5"]) centered about floor inlet in conjunction with 3.08.C.3.a. Trim PVC floor membrane approximately 12mm (½") greater than flange radius (flange diameter +25mm [1"]). Weld approximately 50mm (2") of floor membrane to top surface of PVC membrane ring. Liquid seal cut/exposed edges of PVC membrane according to section 3.04.C 'Chemical Seals'.
  - c. Install all screws in inlet flange according to manufacturer's recommendations regarding screw torque. Do not over-tighten.
4. Install screws, cover plates, flanges, and gaskets immediately prior to pool commissioning.
- D. Wall Inlets
1. Remove locking rings and adjustable eyelet assemblies and store well-marked in secure location.
  2. If supplied, install protective cover caps until locking rings and eyelets are installed.
  3. Install locking rings and adjustable eyelet assemblies immediately prior to pool commissioning.
- E. Bottom Drains
1. Remove grille and install under-membrane drain sub-assembly (if supplied). Install temporary wood or other protective covering securely over drain.
  2. Set drain body flush with adjacent concrete.
  3. Temporarily remove bracing members located over drain flanges as required to facilitate drain plumbing pressure testing. Immediately re-install bracing members upon completion of testing.
  4. Install drain grilles prior to pool commissioning, in accordance with manufacturer compliance instructions.
- F. Pool Play Equipment
1. Pool Play Equipment shall be equipped with steel and/or rigid PVC flange and counter-flange and two gaskets.
  2. In lieu of manufacturer supplied counter flanges and gaskets, pool system manufacturer or pool installer may provide a custom structural steel counter flange and gaskets or rigid PVC counter flange drilled to facilitate mechanical or chemically anchored fasteners per toy manufacturer's recommendations along with required gaskets. Pool system manufacturer shall supply installation details of custom systems/installations.

### 3.08 ERECTION AND LOCATION TOLERANCES

- A. Horizontal Line
1. Face of pool at pool edge shall remain within +/- ¼" of designed dimensions.
- B. Structure Elevation
1. Elevation of wall system below tile or coping shall remain within +/- 1/8" of required elevation to achieve finished pool water level.
- C. Finished Skim Elevation
1. Finished elevation of skimming tile or coping shall remain within +/- 3/32" of specified pool water level.

### 3.09 WATER TIGHTNESS TEST

- A. General
1. A water tightness test shall be completed on each prefabricated pool shell, pool gutter system, and surge tank, independently of each other.

2. The cost of the water shall be allocated as outlined in Specifications Section 13 11 14, Part 3, 3.02, F.
3. Contractor shall include and itemize these requirements in the overall construction schedule.
4. The Owner may elect to waive leak test requirements. Only the Owner may waive these requirements. If the Owner elects to waive these requirements the Contractor is still responsible for providing leak-free structures.

B. Water Tightness Test Procedure

1. Preparation
  - a. Securely seal all inlets/outlets and penetrations prior to fill.
  - b. The test shall not be scheduled when the weather forecast indicates the water surface could freeze before the test is completed.
2. Fill
  - a. Fill the pool with potable water from an approved water source, and then isolate the pool, the surge tank, and the gutter system
  - b. Fill each structure to the design maximum liquid level or 4 inches below any fixed overflow level.
  - c. After the initial fill, remove ground water to a level below the bottom of the structure main drain or floor slab (below lowest concrete plane) utilizing the pool observation tube and/or the pool de-watering system. This shall be completed prior to the start of the water tightness test and maintained for the duration of the test.
  - d. For elevated pools with secondary containment structure, the secondary containment structure shall be monitored for the presence of water for the duration of the test.
3. Evaporation/Precipitation Measurement Procedure
  - a. Partially fill a floating, restrained, calibrated (known volume and surface area), open container (hereafter "container" or "control container") with water and allow this container to float within the filled structure during the testing period. This will be used to measure total evaporation and precipitation.
  - b. Mark and measure the change in container's water level. If the container water level has gone down (evaporation), this change shall be subtracted from each structure's water loss measurement. If the container water level has risen (rain), this change shall be added to each structure's water loss measurement.
4. Measurement
  - a. Conduct all measurements with the Architect or Owner's representative present and document all measurements on the table below.
  - b. Provide an as-built drawing or sketch the pool, and gutter identifying measurement locations and the evaporation control container's location.
  - c. The water surface elevation shall be recorded to within 1/16 of an inch, measured from a fixed point on the structure above the water surface.
  - d. Average multiple sample locations for structures exposed to wind.
  - e. Repeat and record the measurements for a total of three (3) consecutive days.

Measurement Times	Pool Measurements	Gutter System Measurements	Surge Tank Measurements	Control Container Measurements
12 Hrs.				
24 Hrs.				
36 Hrs.				
48 Hrs.				
60 Hrs.				
72 Hrs.				

5. Water Leakage
  - a. Calculate water leakage as follows:  
 Leakage [Gallons] = [7.481 x Structure Surface Area (SF)] x

[Structure Loss Measurement\* (FT) – Control Container Measurement (FT)].

- Structure loss measurement is a generic term referring to Pool Measurement, and Gutter System Measurement independently. Calculate the leakage from the pool, gutter, independently.
- b. Add the measurements for two consecutive 12-hour periods to obtain the total daily loss due to leakage.
  - c. Record Daily losses due to leakage for Day #1, #2, and #3 in the table below.

Total Daily Loss Due To Leakage	Pool Leakage	Gutter Leakage	Surge Tank Leakage
Day 1			
Day 2			
Day 3			

6. Submittal
  - a. Provide test location as-built/sketch, measurement tables, and Water Leakage calculations to Engineer in the form of a submittal for review and records.
7. Allowable Loss from Leakage
  - a. The lined prefabricated pool vessel shall have no measurable loss when adjusted for evaporation and precipitation.
  - b. The allowable leakage rate for an unlined concrete surge tank structure shall not exceed 0.1 percent of the total water volume in a 24-hour period. (Example: 0.001 x 10,000-gallon tank = 10 gallons per 24-hour period.)
  - c. Elevated pools and gutters with a secondary containment vessel shall have no measurable loss; the drop in the water surface shall not exceed 1/8" over the three-day test period when adjusted for evaporation and precipitation.
8. Repair and Retest
  - a. If the leakage volume calculated exceeds the "allowable loss" in section 7, Contractor shall locate, identify, and eliminate leakage points per the pool manufacturer's requirements and/or per the concrete specification requirements and/or the Engineer's requirements. Provide documentation on the location and method of each leak repair.
  - b. After proper curing of all repair work, re-test the water tightness of structure following the procedure specified in this section. Cost of re-testing is the responsibility of the contractor.

**END SECTION**



**131118**  
**POOL CONCRETE**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Cast-in-Place Concrete to be used for pool floor and wall construction and related structures including surge/collector/balance tanks.
  - 2. Admixtures.
  - 3. Curing and Treatment Requirements.
  - 4. Formwork, shoring, bracing, and anchorage.
  - 5. Concrete reinforcement and accessories.
- B. Related Sections:
  - 1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section

**1.02 REFERENCES**

- A. Incorporated Guides and References:
  - 1. American Concrete Institute (ACI):
    - a. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
    - b. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
    - c. ACI 304.2R - Placing Concrete by Pumping Methods.
    - d. ACI 305R - Hot Weather Concreting.
    - e. ACI 309R – Guide for the Consolidation of Concrete.
    - f. ACI 347 – Guide to Formwork for Concrete.
    - g. ACI SP-66 – ACI Detailing Manual.
  - 2. Concrete Reinforcing Steel Institute (CRSI):
    - a. CRSI Manual of Standard Practice
    - b. CRSI 63 – Recommended Practice for Placing Reinforcing Bars.
  - 3. National Electric Code (NEC):
    - a. Article 680 – Swimming Pools, Fountains, and Similar Installations.
- B. Specifications & Standards:
  - 1. American Concrete Institute (ACI):
    - a. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
    - b. ACI 301 - Specifications for Structural Concrete.
    - c. ACI 305.1 – Specification for Hot Weather Concreting.
    - d. ACI 306.1 – Standard Specification for Cold Weather Concreting.
    - e. ACI 308.1 – Specification for Curing Concrete.
    - f. ACI 315 - Details and Detailing of Concrete Reinforcement.
    - g. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
    - h. ACI 350.1 – Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures
  - 2. ASTM International (ASTM):
    - a. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
    - b. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
    - c. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
    - d. ASTM C33 – Standard Specification for Concrete Aggregates.
    - e. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
    - f. ASTM C94 – Standard Specification for Ready-Mixed Concrete.

- g. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete
- h. ASTM C150 – Standard Specification for Portland Cement.
- i. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
- j. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.
- k. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- l. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
- m. ASTM C321 – Standard Test Method for Bond Strength of Chemical-Resistant Mortars.
- n. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
- o. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete.
- p. ASTM C672 – Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
- q. ASTM C1602 – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- r. ASTM D4541 – Standard Test Methods for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- s. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
- 3. Corps of Engineers:
  - a. CRD C-527 - Corps of Engineers Specification for Polyvinylchloride Water Stop.
- 4. NSF International (NSF)
  - a. NSF/ANSI Standard 61 – Drinking Water System Components

### 1.03 SUBMITTALS

- A. Submit proposed mix design of each class of concrete to Engineer/Architect not later than 10 days after Notice to Proceed or twenty-one (21) days prior to the first concrete placement, whichever comes first.
- B. Submit shop drawings of reinforcing steel under provisions of Division 01 – General Requirements.
  - 1. Initial submittal of reinforcement shop drawings shall be complete. No partial submittals will be accepted.
  - 2. Indicate reinforcement sizes, spacing, locations and quantities of reinforcing steel, bending and cutting schedules, splicing, supporting and spacing devices. Include additional reinforcement for opening through concrete structures.
  - 3. Reinforcement placement shop drawings shall conform to ACI SP-66 providing full wall elevations.
- C. Material Certificates: For each of the following, signed by the manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Waterstops.
  - 4. Non-shrink grouts.
  - 5. Expansion Joint Materials.
  - 6. Sealants.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates.
  - 2. Concrete Testing
  - 3. Compaction

### 1.04 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, 305.1, and 306.1.
- B. Maintain copy of ACI 301 on site.

- C. Qualifications of Pool Contractor
  - 1. Work of this Section shall be performed by a Contractor who has a proven record of competence and experience in the construction of similar facilities of this size and complexity for not less than five (5) years. Contractors shall have an established record of reliability.
- D. Qualifications of Nozzleman and Gunman
  - 1. Except when shotcrete is applied under a fully automated process, the quality of shotcrete depends largely on the skill of nozzleman and gunman, and the Contractor shall satisfy the Architect/Engineer that the nozzleman has had a minimum of two years' continuous experience on shotcreting of this type of work, and that the gunman has handled the gun for a period of at least six months. The nozzleman shall show proof of good quality successful shotcreting work similar to that required for this project. Experience gained on shotcrete and ditch construction will not be considered as experience for qualifying the nozzleman.
- E. Concrete Testing: The following tests shall be performed during construction of the project. Refer to General Conditions and Division 01 for further requirements.
  - 1. Tests to measure slump, entrained air content and compressive strength shall be conducted by independent testing laboratory employed by the Contractor unless noted otherwise in front-end specifications.
    - a. of two 6 by 12 in. cylinders or three 4 by 8 in. cylinders per 150 cubic yard or fraction thereof for each class of concrete poured each day. Comply with ACI 318 (samples secured - ASTM C172, cylinders prepared and cured - ASTM C31, and tested - ASTM C39). Identify samples moist cure at 70 degrees F for five (5) days and ship samples to laboratory.
  - 2. Slump and Air Content Tests
    - a. Perform on concrete from same batch as sampled for strength tests and whenever there is consistency of concrete. Slump tests shall be made in accordance with ASTM C143. Air content tests shall be made in accordance with ASTM C231. If measured slump or air content falls outside specified limits, check shall be made immediately on another portion of same sample. In event of second failure, concrete shall not be used in Work.
  - 3. Compliance
    - a. Average of any three (3) consecutive strength tests for each class of concrete shall be equal to or greater than specified strength, and no individual test shall fall more than 500 psi below specified strength.
    - b. When tests results are below specified requirements or when tests of field cured cylinders indicate deficiencies in protection and curing, Architect/Engineer may require additional tests in accordance with ACI 318.
- F. Wet Mix Process Cylinder Sample
  - 1. Where automated wet mix equipment is used, shotcrete cylinders shall be taken from the mixer or ready-mix truck and tested in accordance with the requirements specified in this Section. Wet mix processes shall only be used with approved automated equipment.
- G. Pools and surge tanks shall have a water tightness performed per ACI 350.1. Documentation of testing and results shall be submitted for review. Refer to Water Tightness Test section of this specification.

#### **1.05 REGULATORY REQUIREMENTS**

- A. Conform to requirements of local, state and federal rules and regulations applicable to Work and Project location.

#### **1.06 ENVIRONMENTAL REQUIREMENTS**

- A. Cold Weather Concreting
  - 1. Placement and curing of concrete where (1) average daily temperature for three consecutive days is less than 40 degrees F, and (2) air temperature is not greater than 50

degrees F for more than one-half of a 24-hour period from midnight to midnight shall be in accordance with ACI 306.1.

- B. Hot Weather Concreting
  - 1. Placement and curing of concrete subject to a combination of (1) rising air temperature (generally greater than 75 degrees F) and (2) wind and low relative humidity shall be in accordance with ACI 305.1.
  - 2. Contractor shall provide plan for minimizing exposure of concrete to adverse conditions due to combinations of high air temperature, direct sunlight, drying winds, and high concrete temperature.
  - 3. Protect concrete from rapid temperature drop.
  - 4. Pre-wet subgrade and forms.

### **1.07 WARRANTIES**

- A. Special 2-Year on Concrete Structure: The Pool Contractor shall guarantee for two (2) years repair of the concrete pool structure.

## **PART 2 PRODUCTS**

### **2.01 SUBGRADE, SUBBASE AND BACKFILL MATERIALS**

- A. Pool Subgrade:
  - 1. In-situ soils meeting the Project Geotechnical Report requirements for materials and preparation.
  - 2. Subgrade soils must meet the soil parameters for pool structural design as stated in the Pool Structural Drawings for:
    - a. Net allowable soil bearing capacity in pounds per square foot (PSF),
    - b. Stated equivalent fluid pressure in pounds per square foot per foot (PSF/FT),
    - c. Ground water elevation
  - 3. Pool subgrade materials shall be free of large rocks, organic matter, and other deleterious substances.
- B. Filter Fabric:
  - 1. MIRAFI 140N: Nonwoven polypropylene geotextile barrier, 4.8 oz/yd<sup>2</sup>, by Tencate Geosynthetics.
- C. Pool Subbase & Backfill Materials:
  - 1. Existing subsoil materials shall not be used for pool subbase.
  - 2. ASTM D 2487 Class IA Manufactured Aggregate:
    - a. Aggregate containing little or no fines (clear), including angular, crushed stone or rock, crushed slag, cinders, or shell.
    - b. Gradation: Open graded, clean: < = 10% Passing No.4 sieve, < 5% Passing No. 200 sieve.
    - c. Pool Subbase: ¾" to 1" nominal sized aggregate.
    - d. Pool backfill against Myrtha Pool Walls structure

### **2.02 FORM MATERIALS**

- A. Plywood Forms: Douglas Fir or Spruce-Pine-Fir species: Sound, undamaged sheets with clean true edges, exterior glue, facing material to provide finish specified.
- B. Lumber: Douglas Fir or Spruce species; construction grade or better; with grade stamp clearly visible.
- C. Preformed Steel Wall Forms: Minimum 16 gage thick, Vertically and horizontally matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and surface appearance.
- D. Tubular Column Type: Round, spirally wound laminated fiber material; inside surface treated with release agent.

- E. Form Ties for Exposed Surfaces: Plastic cone snap ties with 1-inch outside diameter by 1-inch (nominal) long cones, with no metal within 1-inch of concrete face after removal;
  - 1. Manufacturers:
    - a. [Advance Concrete Formwork, Inc.](#)
    - b. [Dayton Superior.](#)
    - c. [Symons - A Dayton Superior Company.](#)
    - d. [Williams Form Engineering Corporation.](#)
    - e. Substitutions: As approved by Engineer/Architect.

### 2.03 REINFORCING STEEL

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade carbon steel deformed bars; uncoated, finish.
- B. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete. Supports shall have a minimum 2" concrete cover on waterside of pool concrete.

### 2.04 CONCRETE MATERIALS

- A. Cementitious Materials
  - 1. Portland Cement: ASTM C150, gray color, Type I except as specified below.
  - 2. Fly Ash: ASTM C618, Class C.
  - 3. Limit cement replacement to 20%.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: ASTM C1602, clean and not detrimental to concrete.
- D. Admixtures
  - 1. Admixtures to be used in the concrete mixture shall be submitted to the Engineer for approval as part of the mixture proportions.
  - 2. Admixtures containing intentionally-added chlorides, sulfides, or nitrides are not permitted.
  - 3. Admixtures shall be certified to NSF/ANSI 61.
  - 4. Air-Entraining Admixture: ASTM C260.
  - 5. Water Reducing Admixture: ASTM C494, Type A.
  - 6. Retarding Admixture: ASTM C494, Type B or Type D.
  - 7. Accelerating Admixture: ASTM C494, Type C or Type E.
  - 8. High-Range Water-Reducing Admixture: ASTM C494, Type F.
  - 9. Workability-Retaining Admixture: ASTM C494, Type S.
  - 10. Shrinkage-Reducing Admixture: ASTM C494, Type S.
  - 11. Crystalline Waterproofing Admixture: ASTM C494, Type S.
  - 12. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations.
  - 13. Admixtures permitted shall be supplied by a single manufacturer for project.
  - 14. Approved Manufacturers:
    - a. Axim Italcementi Group.
    - b. Master Builders Solutions
    - c. Grace Construction Products.
    - d. The Euclid Chemical Company.
    - e. Xypex
  - 15. Substitutions: As approved by Engineer/Architect.

### 2.05 ACCESSORIES

- A. Pool Concrete PVC Waterstop
  - 1. Center bulb type, as shown on Drawings, extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinyl chloride (PVC). The size shall be as shown. Specific gravity shall be approximately 1.37, and the Shore durometer Type A hardness

- approximately 80. No reclaimed PVC shall be used in the compound. Meet the performance requirements of CRD C-572.
2. Waterstop shall have a constant thickness from the edge of the bulb to the outside edge. All waterstops shall have a number of parallel ribs or protrusions on each side of the center of the strip. Corrugated type or tapered waterstops are not acceptable. The minimum weight per foot for waterstop shall be 1.62 pounds for 3/8-inch by 6-inch and 2.30 pounds for 3/8-inch by 9-inch.
  3. Manufacturers and suppliers who have provided samples meeting the specified geometry and who have the specified waterstop readily available are listed below. Other products shall not be used without prior review and acceptance by the Architect/Engineer.
    - a. Sika Greenstreak Waterstops, P.O. Box 7139, St. Louis, Missouri 63177, phone: (314) 225-9400 or fax: (314) 225-9854. Style 717 for the 6-inch by 3/8-inch and Style 735 for the 9-inch by 3/8-inch.
    - b. BoMetals, Inc., 141 Hammond Street, Carrollton, GA. Phone 770-832-2000 or fax (770-832-2095). Style RCB638NT for the 6-inch by 3/8" and style RCB938NT for the 9-inch by 3/8".
    - c. Paul Murphy Plastics Company, Wirestop Waterstop, 15301 Eleven Mile Road, Roseville, Michigan, 48066, phone 800-544-2200 fax 586-774-9146. Style CR-6380 for the 6-inch x 3/8" and Style CR-9380 for the 9-inch by 3/8".
- B. Pool Concrete Compressible Waterstop
1. Use as illustrated in drawing details for the following:
    - a. Sealing non-moving cold joints and construction joints between structural elements against penetration of water from wet-face of structure with less than 30-foot hydrostatic head.
    - b. Sealing pool piping penetrations against water penetration from wet-face of structure with less than 30-foot hydrostatic head.
  2. Product Description: The product shall be a 0.59" x 0.39" compressible hydrophilic sponge rubber strip composed of vulcanized rubber and urethane polymer as the hydrophilic agent.
  3. Product & Manufacturer:
    - a. Adeka KBA-1510FP waterstop, manufactured by Adeka Corporation and distributed by OCM, Inc., Chicago, IL. USA.
    - b. Website: [www.adeka.com](http://www.adeka.com)
    - c. Physical & Swelling Property Requirements: The product shall at a minimum meet the physical properties as shown in the official Adeka literature as follows.
    - d. Expansion Pressure: The product shall not produce more than 0.03MPa (4.35 psi) expansion pressure when fully hydrated.
    - e. Tensile Strength: At least 0.78 MPa (113 psi),
    - f. % Elongation: No greater than 350% when fully hydrated.
    - g. Volume (thickness) % Change: No greater than 30% volume change or increase in thickness when fully hydrated.
    - h. Alternative Products:
      - 1) General: Drawing documents have been completed using the specified Adeka waterstop product as a basis of design. Alternative compressible waterstops shall not be used without approval from Engineer/Architect. Considerations such as concrete coverage requirements and wall thicknesses must be considered when substituting alternative products. Contractor will be responsible for any structural changes required due to alternate product concrete coverage requirements.
      - 2) Product Requirements: Compressible waterstop alternatives may not contain bentonite materials and may not have swelling properties that exceed the specified product.
      - 3) Acceptable Alternative: An acceptable alternative may be Synko-Flex SF302 Preformed Plastic Adhesive Waterstop with Synko-Flex SF311 primer or equal,

but it must be approved prior to use. Manufacturer: Henry Company, Houston, TX. Website: <http://henry.com>

- C. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi.
  - 1. Upcon High Flow, the Upco Company, Cleveland, Ohio; MasterFlow 713, Master Builders Solutions, Cleveland, Ohio; Duragrout, L & M Construction Chemicals, Inc., Omaha, Nebraska.
- D. Joint Materials:
  - 1. Waterstop: See Pool Concrete PVC Waterstop.
  - 2. Expansion Joint Dowel Sleeves: PVC or molded plastic sleeve with end cap/plug. Size sleeve to allow movement of dowel.
  - 3. Pre-molded Expansion Joint Filler: Multicellular, closed cell, flexible polyethylene plastic foam as manufactured by Dow Chemical Co., Midland, MI. Ethafoam expanded polyethylene closed-cell foam, W.R. Meadows, Elgin, IL, Ceramar or a pre-approved equal.
  - 4. Backer Rod Joint Backing Material: Closed cell, polyethylene, flexible, rope-like foam joint backing material. Material shall be fully compatible with polysulfide sealant and for use in swimming pools. Product shall be Kool-Rod as Manufactured by W.R. Meadows, Elgin, IL, or pre-approved equal.
  - 5. Gun Grade Sealant: Two-part polysulfide sealant and primer certified by Manufacturer as suitable for use in pools including submerged locations. "Deck-O-Seal Gun Grade" and "P/G" solvent based primer as manufactured by W.R. Meadows or equal. Color shall be white.

## 2.06 CURING AND TREATMENT MATERIALS

- A. Water: Potable and clean.
- B. Burlap shall be clean, evenly woven, free of encrusted concrete or other contaminating materials, and shall be reasonably free of cuts, tears, broken or missing areas.
- C. Polyethylene Film: ASTM C171, 6 mil thick, clear.
- D. Curing Paper: ASTM C171;
  - 1. Manufacturers:
    - a. Fortifiber – Orange Label Sisalkraft 280.
    - b. Substitutions: As approved by Engineer.

## 2.07 CONCRETE MIXTURE

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture of field test data, or both, according to ACI 301.
- B. Mix concrete in accordance with ASTM C94.
- C. Concrete mix designs shall be designed and submitted in accordance with Division 01 and included as part of cost of this Work.
- D. Mix designs shall be prepared by a qualified agency acceptable to Engineer/Architect. Electronic copies of mix designs shall be submitted for Engineer/Architect's review prior to placing any concrete.
- E. Mix design shall indicate brands, types, and quantities of admixtures included, compressive strength, slump, sieve analysis for fine and coarse aggregate, quantities of all ingredients, type and brand of cement, source of aggregate, whether fine aggregate is natural or manufactured.
- F. Design of mix shall assure placing and finishing characteristics that meet Project requirements.
- G. Mix designs contained in the Schedule of Mixes may be modified and submitted to Engineer for approval, by use of mid or high range water reducing admixtures to control slumps required for pumping of concrete. Strength, placing and finishing requirements shall be maintained.

- H. Concrete mixtures shall be designed to have low shrinkage characteristics and designed to minimize slab curling.
- I. Initial and final set times of concrete mix designs shall be coordinated between the contractor and concrete supplier.

## **2.08 SCHEDULE OF MIXES**

- A. Pool Structures: Proportion normal-weight concrete mix as follows:
  - 1. Compressive Strength (28 Days): 4500 psi.
  - 2. Maximum Aggregate Size: 1 inch.
  - 3. Maximum Slump (Inch): 3
  - 4. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent. Required for pool structures subject to freeze/thaw cycles.
  - 5. Maximum Water-Cementitious Materials Ratio: 0.45.
  - 6. Additional admixtures may be required as indicated on Structural Drawings.
- B. Surge Tanks (Walls and Floor): Proportion normal-weight concrete mix as follows:
  - 1. Compressive Strength (28 Days): 4500.
  - 2. Maximum Aggregate Size: 1- inch.
  - 3. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent. Required for tanks subject to freeze/thaw.
  - 4. MasterLife 300D or Xypex C-500 admixture: Provide dosage per manufacturer's recommendations.
- C. Shotcrete: Proportion normal-weight concrete mix as follows:
  - 1. Compressive Strength (28 Days): 5000 psi.
  - 2. Wet-mix design only. Dry mix, mixed at the nozzle, shall not be allowed.
  - 3. Maximum Aggregate Size: 3/8 - inch.
  - 4. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent. Required for pool structures subject to freeze/thaw cycles.
  - 5. Additional admixtures may be required as indicated on Structural Drawings.

## **PART 3 EXECUTION**

### **3.01 SUBGRADE, SUBBASE AND BACKFILL PLACEMENT**

- A. Prepare pool subbase using in-situ soils in compliance with the Project Geotechnical Report placement methods and testing requirements. Materials shall be graded to proper elevations, free of large rocks, organic matter, and other deleterious substances.
- B. Place geotextile barrier below entire pool and up the sides of the pool walls separating the subbase aggregates and pool backfill aggregates from the subgrade and remaining backfill or in-situ soils to prevent mitigation of fines.
- C. Place pool subbase & backfill aggregate materials in 6" compacted lifts to minimize void spaces and eliminate potential future settlement. Compact materials using walk-behind plate compactors properly sized and operated to prevent damage to pool pipes.

### **3.02 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 concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance per ACI 117.
- C. Verify lines, levels, and measurement before proceeding with formwork.
- D. Earth forms are not permitted.
- E. Align form joints.



- F. Do not apply form release agent where concrete surfaces receive special finishes or applied coatings which may be affected by agent.
- G. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

### 3.03 REINFORCEMENT

- A. Place, support, and secure reinforcement against displacement.
- B. Locate reinforcing splices as shown on Drawings.
- C. Place reinforcing steel in conformance with the information on the drawings and CRSI 63 and CRSI, except as modified herein. Minimum length of splices shall be as shown in table on drawings. Tie splices with 18-gauge annealed wire as specified in the referenced CRSI standard. All tie wires shall be "made tight" for electrical bonding purposes, as required by NEC, Article 680.

### 3.04 WATERSTOP

- A. PVC Waterstop
  - 1. Split formwork is generally required for slab-to-slab, slab-to-wall and wall-to-wall joints where ribbed style waterstops are used. The centerline of the waterstop should be aligned with the center of the joint. The split form shall firmly hold the waterstop in position to prevent misalignment of waterstop during concrete placement. Secure waterstop with hog rings or integral wire loops prior to concrete placement. Loop tie wires through the hog ring/wire loops and tie off to adjacent reinforcing steel to prevent displacement of the waterstop during concrete placement. Fasteners through the body of the waterstop are not permitted.
  - 2. Lapping of the waterstop is not permitted. PVC waterstop may be butt spliced in the field with Teflon coated, thermostatically controlled splicing iron. Direct exposure to a flame is not permitted. Factory fabricated fittings are recommended for ells, tees and crosses.
    - a. The following defects at splices will not be acceptable:
      - 1) Use of adhesives, solvents, or free lap joints
      - 2) Misalignment of center bulb greater than 1/16"
      - 3) Misalignment that reduces waterstop cross section area more than 15%.
      - 4) Bond failure at joint, deeper than 1/16" or 15% of material thickness.
      - 5) Combination misalignment and bond failure with net reduction of waterstop cross-section area greater than 15%.
      - 6) Misalignment of waterstop splice resulting in misalignment of waterstop in excess of 1/2" in 10 feet.
      - 7) Visible porosity in the weld joint, including pinholes
      - 8) Charred or burnt material
      - 9) Bubbles or inadequate bonding detectable with a penknife
      - 10) Visible signs of splice separation when cooled splices are bent at a sharp angle.
      - 11) Edge welding
  - 3. Thoroughly consolidate the concrete around the waterstop to prevent voids or honeycombing next to the waterstop. Maintain adequate clearance between reinforcing steel and the waterstop. Typical clearance should be twice the maximum aggregate size. Maintain continuity of the entire waterstop system. Properly store PVC waterstops prior to installation to prevent UV degradation.
- B. Compressible Waterstop – Adeka KBA-1510FP
  - 1. Non-moving Joint Installation:
    - a. Consult manufacturer and follow all recommended installation instructions.
    - b. Allow concrete to cure a minimum of 24 hours.
    - c. Concrete must be dry and free from form oils, release agents, curing compounds, laitance and other dirt or debris prior installation. Use a wire brush to remove contaminants prior to installation of waterstop.

- d. Use butyl tape to attach KBA-1510FP to a dry and clean substrate. The butyl tape comes in a 3/4" X 1/8" X 82-foot roll (1 roll per roll of KBA-1510FP). Press the butyl strip onto the substrate and remove the release paper. Press the KBA-1510FP firmly onto the butyl tape.
  - e. Check for any gaps between the product and the substrate. If gaps are present, fill in using Adeka P-201 applied to the side of the strip. Use P-201 on corner joints and on side-by-side splice joints.
  - f. Once installed, keep the product covered, clean, and dry prior to concrete placement. For best results, place the waterstop product immediately before pouring concrete. Check to make sure the waterstop is firmly adhered before placing concrete.
  - g. During concrete placement, assure that the concrete is well consolidated around the waterstop at all locations with no voids or gaps.
2. Penetration Installation:
- a. Consult manufacturer and follow all recommended installation instructions.
  - b. Pipe must be dry and free from form oils, release agents, curing compounds, laitance, and other dirt or debris prior to installation.
  - c. Press the butyl strip onto the clean pipe completely around the pipe diameter and remove the release paper. Press the KBA-15010FP firmly onto the butyl tape. Tightly butt strip ends together with 1" overlap or side lap.
  - d. Once installed, keep the product covered, clean, and dry prior to concrete placement. For best results, place the waterstop product immediately before pouring concrete. Check to make sure the waterstop is firmly adhered before placing concrete.
  - e. During concrete placement assure that the concrete is well consolidated around the waterstop at all locations with no voids or gaps.
3. Alternative Products Installation:
- a. Drawing documents have been completed using the specified Adeka waterstop product as a basis of design. Alternative flexible adhesive waterstops shall not be used without approval from Engineer/Architect. See Section 2 for additional information.
  - b. If Synko-Flex has been approved during the submittal process, the following installation requirements shall be met, as well as all manufacturer's installation instructions.
    - 1) Allow concrete to cure a minimum of 24 hours before priming with Synko-Flex primer.
    - 2) Concrete must be dry and free from form oils, release agents, curing compounds, laitance and other dirt or debris prior to priming. Use a wire brush to remove contaminants prior to installation of primer.
    - 3) Apply Synko-Flex SF311 primer.
    - 4) Apply Synko-Flex SF302 Preformed Plastic Adhesive Waterstop over primed areas. Place Synko-Flex to primed areas at an approximately 5/8" thickness and approximately 1 1/2" width.
    - 5) Tightly butt strips together with 1" overlap or side lap.

### **3.05 PLACING CONCRETE**

- A. Notify Engineer/Architect a minimum of 48 hours prior to commencement of concreting operations.
- B. Failure to notify Engineer/Architect may result in rejection of concrete placed without observation.
- C. Place concrete in accordance with ACI 301.
- D. Place pumped concrete in accordance with ACI 304.2R. Line coating mix to initiate pumping shall not be used in pour but shall be wasted.
- E. Ensure reinforcement and embedded items are not disturbed during concrete placement.

- F. Concrete with excessive honeycomb or embedded debris shall be rejected and replaced at no cost to OWNER.
- G. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.
- H. Placing During Hot Weather:
  - 1. Place concrete during hot weather conditions in accordance with ACI 305.1.
- I. Placing During Cold Weather:
  - 1. Place concrete during cold weather conditions in accordance with ACI 306.1.
- J. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

### **3.06 EXPANSION & CONTROL JOINTS**

- A. All control and expansion joints require PVC waterstop.
- B. Installation of Joint Filler: At locations where joint sealant is to be applied, the pre-molded joint filler shall be installed in the joint accurately as detailed. Precut the pre-molded expansion joint filler to the required depth. Filler material shall be of sufficient width to completely fill the joint and shall be accurately cut to butt tightly against the waterstop and the side forms. Attach filler material to concrete with a bonding agent. Bonding agent shall be approved in writing by the joint sealant and joint filler manufacturer for compatibility.
- C. Concrete shall be thoroughly vibrated along the joint form to produce a dense, smooth surface. Surface irregularities along the joint sealant cavity, due to improper concrete consolidation or faulty form removal, shall be repaired with an approved compound compatible with the joint sealant in a manner that is satisfactory to the sealant manufacturer.
- D. All expansion and control joints require gun grade sealant. Cavities for joint sealant shall be formed with precut or pre-molded joint filler that can be removed as needed for sealant. Circular backer rod shall be used in joints as detailed to provide accurate shape for sealant.

### **3.07 CONSTRUCTION JOINTS**

- A. Construction joints shall be located as required for the contractor's scheduling, means and methods.
- B. All construction joints require waterstop.
- C. Contractor shall provide a submittal showing construction joint locations and detailing for review and approval.

### **3.08 CURING AND TREATMENT**

- A. Curing shall begin promptly to prevent drying of concrete. Curing shall continue for seven (7) days after placing.
- B. Provide a moist cure for a full seven (7) days in accordance with ACI 308.1. Keep concrete slabs and walls continuously wet for a 7-day period. Intermittent wetting is not acceptable. Material shall completely cover the concrete surface and shall be weighted down to prevent shifting due to wind or other factors.

### **3.09 REPAIR OF VERTICAL SURFACE DEFECTS**

- A. Upon stripping of forms, vertical surfaces shall be inspected for defects caused by surface air voids, honeycombing, form tie holes, peeling, and fins.
- B. Surface air voids shall be repaired with a unit packaged mixture of sand and cement mixed on job site with water and a unit of acrylic. Mixture shall be brushed uniformly on to surface and into voids. Where surface is to be exposed, surface finish of repair shall match adjacent surface.
- C. Honeycombed and other defective concrete shall be removed down to sound concrete and patched to match adjacent surfaces. Cut edges perpendicular to surface at least 1 inch deep – no feathered edges allowed.

1. Areas not subject to water shall be repaired similar to surface air voids as indicated above. A bonding agent shall be used prior to filling the holes. Patches shall be kept moist for a minimum of 7 days.
  2. Areas subject to water shall be moist for a period of 24 hours prior to patching. Holes shall be filled with non-shrink grout and cured per recommendations by manufacturer. Concrete surface shall be prepared per recommendations by manufacturer.
- D. Form tie holes shall be filled with non-shrink grout. Surface of concrete to prepared per recommendations by manufacturer. Grout shall be cured per recommendations by manufacturer.

### 3.10 FINISHING

- A. Floor slabs shall not vary from level or true plane more than ¼ inch in 10 feet when measured with a straightedge. Floor slabs shall receive a broom finish to accommodate special aggregate mechanical bonding requirements.
- B. After removal of forms and repair of defects, surfaces of concrete shall be given finishes specified below.
- C. Rough Form Finish: Surface left with texture imparted by forms; form facing material not specified; tie holes and defects shall be patched; all fins shall be chipped or rubbed off. The surface shall be finished in such a way that will leave the surface for the substrate rough, coarse, and porous enough to ensure that subsequent application of the cementitious surface coating can achieve a good mechanical bond to the substrate similar to a broom finish.
- D. Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of formed surface.
- E. Final finish on formed surfaces shall continue uniformly across unformed surfaces.

### 3.11 WATER TIGHTNESS TEST

- A. General
  1. This test applies to the pool, the surge tank, and the gutter system. A water tightness test shall be completed on each pool, surge tank and gutter system, independently of each other, prior to the application of the pool finish.
  2. The cost of the water shall be allocated as outlined in Specifications Section 13 11 14, Part 3, 3.02, F.
  3. Contractor shall include and itemize these requirements in the overall construction schedule.
  4. The Owner may elect to waive leak test requirements if schedule becomes a critical factor. Only the Owner may waive these requirements. If the Owner elects to waive these requirements the Contractor is still responsible for providing leak-free structures, and at a minimum, all specified applicable warranties shall apply.
- B. Water Tightness Test Procedure
  1. Preparation
    - a. Visually examine the concrete structure and joints for potential leakage prior to fill. Contractor shall repair areas of potential leakage prior to fill.
    - b. Allow the concrete structure to cure a minimum of 28 days, or as required to gain sufficient strength to withstand the test load, prior to initiating test.
    - c. Securely seal all inlets/outlets and penetrations prior to fill.
    - d. The test shall not be scheduled when the weather forecast indicates the water surface could freeze before the test is completed.
  2. Fill
    - a. Fill the pool with potable water from an approved water source, and then isolate the pool, the surge tank, and the gutter system. The water tightness test and measurement documentation shall begin after the test structure has been filled for a

- minimum of three (3) days to allow the concrete to absorb water and minimize absorption effects during the testing period.
- b. Fill each structure to the design maximum liquid level or 4 inches below any fixed overflow level.
  - c. After the initial fill, remove ground water to a level below the bottom of the structure main drain or floor slab (below lowest concrete plane) utilizing the pool observation tube, the pool de-watering system, or the construction dewatering system. This shall be completed prior to the start of the water tightness test and maintained for the duration of the test.
  - d. For elevated pools with secondary containment structure, the secondary containment structure shall be monitored for the presence of water for the duration of the test. Groundwater elevation is not a factor in these pools.
3. Evaporation/Precipitation Measurement Procedure
- a. Partially fill a floating, restrained, calibrated (known volume and surface area), open container (hereafter "container" or "control container") with water and allow this container to float within the filled structure during the testing period. This will be used to measure total evaporation and precipitation.
  - b. Mark and measure the change in container's water level. If the container water level has gone down (evaporation), this change shall be subtracted from each structure's water loss measurement. If the container water level has risen (rain), this change shall be added to each structure's water loss measurement.
4. Measurement
- a. Conduct all measurements with the Architect or Owner's representative present and document all measurements on the table below.
  - b. Provide an as-built drawing or sketch the pool, surge tank, and gutter identifying measurement locations and the evaporation control container's location.
  - c. The water surface elevation shall be recorded to within 1/16 of an inch, measured from a fixed point on the structure above the water surface.
  - d. Average multiple sample locations for structures exposed to wind.
  - e. Repeat and record the measurements for a total of three (3) consecutive days.

Measurement Times	Pool Measurements	Gutter System Measurements	Surge Tank Measurements	Control Container Measurements
12 Hrs.				
24 Hrs.				
36 Hrs.				
48 Hrs.				
60 Hrs.				
72 Hrs.				

5. Water Leakage
- a. Calculate water leakage as follows:  

$$\text{Leakage [Gallons]} = [7.481 \times \text{Structure Surface Area (SF)}] \times [\text{Structure Loss Measurement* (FT)} - \text{Control Container Measurement (FT)}].$$
    - Structure loss measurement is a generic term referring to Pool Measurement, Gutter System Measurement or Surge Tank Measurement independently. Calculate the leakage from the pool, gutter, and surge tank independently.
  - b. Add the measurements for two consecutive 12-hour periods to obtain the total daily loss due to leakage.
  - c. Record Daily losses due to leakage for Day #1, #2, and #3 in the table below.

Total Daily Loss Due To Leakage	Pool Leakage	Gutter Leakage	Surge Tank Leakage
Day 1			

Day 2			
Day 3			

6. Submittal
  - a. Provide test location as-built/sketch, measurement tables, and Water Leakage calculations to Engineer in the form of a submittal for review and records.
7. Allowable Loss from Leakage
  - a. The allowable leakage rate for an unlined, open concrete structure (i.e. backfilled pool, gutter, and surge tank) shall not exceed 0.1 percent of the total water volume in a 24-hour period. (Example:  $0.001 \times 200,000$ -gallon pool = 200 gallons per 24-hour period.)
  - b. Elevated pools and gutters with a secondary containment vessel shall have no measurable loss; the drop in the water surface shall not exceed 1/8" over the three-day test period when adjusted for evaporation and precipitation.
8. Repair and Retest
  - a. If the leakage volume calculated exceeds the "allowable loss" in section 7, Contractor shall locate and identify leakage points, repair the structure and provide documentation on the location of repaired areas.
  - b. After proper curing of all repair work, re-test the water tightness of structure following the procedure specified in this section.

**END SECTION**

**131120**  
**POOL PIPE AND PIPE FITTINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, connections, wall penetrations.

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 REFERENCES/PIPE – FITTING REQUIREMENTS**

- A. The following latest edition reference specifications, guides, and standards shall become part of this Specification as if herein written. If provisions conflict, the more stringent provisions shall apply.
1. ANSI/ASTM D2564 - Solvent Cements and ASTM F656 – Primers for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
  2. ASTM D2855 – Practice for Making Solvent Cemented Joints with PVC Pipe and Fittings
  3. ANSI/ASTM D1785 – Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe Schedules 40, 80 and 120, NSF Seal for Potable Water
  4. ASTM D1784 - Standard Specification For Rigid Poly(Vinyl Chloride) (PVC) Compounds And Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
  5. ASTM F439 - Standard Specification For Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedules 80
  6. ASTM F441 - Standard Specification For Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
  7. ASTM F493 - Standard Specification For Solvent Cements For Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe And Fittings
  8. ASTM D2466 – PVC Plastic Pipe Fittings, Schedule 40, Injection Molded, Sizes Through 12”, NSF Listed. As manufactured by Spears Manufacturing Company, “or approved equal”.
  9. ASTM D2467 – Socket Type PVC Plastic Pipe Fittings, Schedule 80, Injection Molded, Sizes through 12”, NSF Listed. As manufactured by Spears Manufacturing Company, “or approved equal”.
  10. ASTM D2855 - Standard Practice For The Two-Step (Primer And Solvent Cement) Method Of Joining Poly (Vinyl Chloride) (PVC) Or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe And Piping Components With Tapered Sockets
  11. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
  12. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  13. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (Modified Proctor Maximum Dry Density)
  14. ASTM F679 – PVC Large Diameter Plastic Gravity Sewer Pipe and Fittings, Bell Gasketed Joints, Sizes 18” Through 36”. As manufactured by J-M Manufacturing Co., Inc. “Perma-Loc”, “or approved equal”.
  15. ASTM B88 – Seamless Copper Water Tube
  16. Eslon Engineering Manual for Plastic Piping Systems
  17. ASTM D2563 – Fabricated, Fiberglass Wrapped PVC Pipe Fittings 14”, and above, Schedule 40 or 80 manufactured from PVC pipe conforming to ASTM D1785 and compliant to the most recent publication of the “Spears General Specification for Standard Fabricated Fittings (FAB-7-702)”. Butt-fusion welded fabricated fittings are not acceptable. All fittings shall be certified for potable water service by NSF. As manufactured by Spears Manufacturing Company or “approved equal”

18. CLASS 150 – All plastic pipe flanges shall be Class 150 and of the same schedule as the associated pipe with neoprene gaskets where required.

#### **1.04 QUALITY ASSURANCE**

- A. Qualifications of Pool Contractor
  1. Work of this Section shall be performed by a Contractor who has a proven record of competence and experience in the construction of similar facilities of this size and complexity for not less than 5 years. Contractors shall have an established record of reliability.
- B. The following tests shall be performed during construction of the project. Refer to General Conditions and Division 01 for further requirements.
  1. Testing and Flushing of Piping
    - a. Contractor shall be responsible for discovering leaks and making necessary repairs.
      - 1) Pressure piping and suction piping: After the piece is laid, the joints completed and the trench partially backfilled, leaving joints exposed for examination, subject new lines to a hydrostatic pressure of not less than 50 pounds per square inch. Joints shall remain watertight under this pressure for a period of two (2) hours. All air must be expelled from pipes prior to testing.
      - 2) Gravity lines: A water test shall be applied to all gravity drain piping systems, either in their entirety or in sections. All openings shall be tightly plugged and each system filled with water and tested with at least a 10 foot head of water (4.3 psi). The water shall be kept in the system, or in the portion under test, for at least fifteen (15) minutes before the inspection starts. System shall be watertight at all joints.
      - 3) Leaks shall be repaired and tested repeatedly until leakage or infiltration is approved.
    - b. Provide documented records of all pipe pressure tests to the Architect/Engineer before covering with concrete. Records must identify each pipe description, recorded pressure readings, test date/time, and test durations.

#### **1.05 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Product Data: For each type of manufactured material and product indicated.
- C. Provide Shop Drawings showing all pipe penetration locations through concrete pump pit walls and concrete surge tank walls. Include dimensioned location of pipe penetrations in plan and elevation view, pipe sizes, sleeve sizes, link-seal sizes, and sleeve and link-seal material/product information.
- D. Provide a submittal including system drain valves and location of drain valves for Owner's use during pool shutdown and/or pool winterizing.

#### **1.06 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

### **PART 2 PRODUCTS**

#### **2.01 PIPE BEDDING & BACKFILL MATERIALS**

- A. Pipe Trench Foundation/Subbase: In-situ soils meeting the Project Geotechnical Report requirements for preparation. Trench base materials shall be free of large rocks, organic matter, and other deleterious substances.
- B. Pipe Trench Embedment Zone (bedding, haunching, initial backfill):
  1. Existing subsoil materials shall not be used for pipe bedding.
  2. Condition 1: ASTM D 2487 Class IA Aggregate.
    - a. Manufactured aggregates containing little or no fines including angular, crushed stone or rock, crushed slag, cinders, or shell.
    - b. Open graded, clean: < = 10% Passing No.4 sieve, < 5% Passing No. 200 sieve



- c. Maximum pipe diameters  $\geq 6"$ : Maximum aggregate size  $\leq 1.5"$ .
  - d. Maximum pipe diameters  $< 6"$ : Maximum aggregate size  $3/4"$ .
  - e. Where conditions may cause migration of fines into the trench from adjacent soil (and loss of pipe support) apply Condition 2 and use Class 1B Aggregate. Alternatively, include the addition of a filter fabric between the trench and Class 1A aggregate to prevent migration of fines into the embedment zone.
3. Condition 2: ASTM D 2487 Class 1B Aggregate.
- a. Use where conditions may cause migration of fines from adjacent soil and loss of pipe support. Process materials as required to obtain gradation which will minimize migration of adjacent materials.
  - b. Manufactured processed aggregates; angular, crushed stone (or other Class 1A materials) and stone/sand mixtures with gradations selected to minimize migration of adjacent soils.
  - c. Dense graded, clean:  $\leq 50\%$  Passing No.4 sieve,  $< 5\%$  Passing No. 200 sieve
  - d. Maximum pipe diameters  $\geq 6"$ : Maximum aggregate size  $\leq 1.5"$ .
  - e. Maximum pipe diameters  $< 6"$ : Maximum aggregate size  $3/4"$ .
- C. Final Pipe Trench Backfill: Use on-site existing soils meeting the Project Geotechnical Report requirements for backfill materials. Final trench backfill may not include organic material, clay, topsoil, or other deleterious substances. The source and suitability of all proposed off-site fill shall be confirmed by the Project Geotechnical Engineer prior to bringing material on site.

## 2.02 PVC & CPVC PIPE & FITTINGS

- A. Refer to Section 1.03 for applicable standards/requirements.
- B. Refer to pipe schedule(s) on drawings for size and type.
- C. PVC Pipe: All PVC Schedule 40 and schedule 80 pipe shall be manufactured from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM D1785 consistently meeting and/or exceeding the quality assurance test requirements of these standards. The pipe shall be provided with plain ends in 20-foot cut lengths. All PVC pipe shall be certified by NSF International for potable water applications and marked accordingly.
- D. PVC Sch40 Fittings: All PVC Schedule 40 white fittings shall be manufactured from PVC Type I cell classification 12454. All fittings of 12" diameter or less shall conform to ASTM D1784 for injection molded PVC Schedule 40 white fittings. All fittings greater than 12" diameter may be either injection molded or fabricated fittings produced in accordance with "Spears General Specification for Standard Fabricated Fittings (FAB-7-702)". All fittings shall be certified for potable water service by NSF International and manufactured in strict compliance to ASTM D2466.
- E. PVC Sch80 Fittings: All PVC Schedule 80 fittings shall be manufactured from PVC Type I, cell classification 12454. All fittings of 12" diameter or less shall conform to ASTM Standard D1784 for injection molded PVC Schedule 80 fittings. All fittings greater than 12" diameter may be either injection molded or fabricated fittings produced in accordance with "Spears General Specification for Standard Fabricated Fittings (FAB-7-702)". All fittings shall be Certified for potable water service by NSF International manufactured in strict compliance to ASTM D 2467.
- F. CPVC Pipe: All CPVC Schedule 80 pipe shall be manufactured from a Type IV, Grade I Chlorinated Polyvinyl Chloride (CPVC) compound with a Cell Classification of 23447 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM F441, consistently meeting the quality assurance test requirements of this standard. All pipe shall be provided with plain ends in 20 foot cut lengths. CPVC Pipe shall be certified by NSF International for potable water applications and marked accordingly.
- G. CPVC Fittings: All CPVC Schedule 80 fittings shall be produced from CPVC materials, cell classification 23447 conforming to ASTM Standard D1784 for injection-molded fittings through 12", and shall be manufactured in compliance to ASTM F439 and Certified by NSF International for use with potable water service. All 14" through 24" fabricated CPVC fittings shall be

produced in accordance with "Spears General Specification for Standard Fabricated Fittings (FAB-7-702)".

- H. PVC Flanges: All PVC & CPVC flanges shall be designed and manufactured to meet CL150 bolt pattern per ANSI Standard B16.5 and rated for a maximum internal pressure of 150 psi, non-shock at 73°F.
- I. Supply/Install transition flanges as required between changes in pipe materials and imperial/metric transitions. See the following sections for flange connection requirements. Buried transitions shall be welded fittings with couplings between unlike materials manufactured. Mechanical flanges shall not be buried/backfilled. See specification below for buried transition fittings.
- J. Manufacturer:
  - 1. As manufactured by Spears Manufacturing Company, "or approved equal".

### **2.03 THREAD TAPE**

- A. Teflon 2

### **2.04 PVC SOLVENT CEMENT**

- A. Joining method for PVC pipe and fittings shall be solvent cement welding. All PVC solvent cement shall be suitable for all class and pipe schedules that are to be utilized.
- B. PVC solvent cement shall conform to ASTM D2564, shall have DWV, SW and U.P. Code listings and be certified by NSF International for potable water use.
- C. PVC solvent cement shall conform to Low VOC emission requirements in accordance with SCAQMD Rule 1168/316A. PVC cement shall be certified by Underwriters Laboratories (UL) to UL 2818 GREENGUARD GOLD for low chemical emissions.
- D. All PVC solvent cement shall be provided in a clear or gray color and have a three (3) year shelf life.

### **2.05 CPVC SOLVENT CEMENT**

- A. Joining method for CPVC pipe and fittings shall be solvent cement welding. All CPVC solvent cement shall be suitable for all class and pipe schedules that are to be utilized.
- B. CPVC Solvent cement shall be manufactured in accordance with ASTM F493 and certified by NSF International for potable water applications.

### **2.06 WALL SLEEVES**

- A. Pipes penetrating all watertight walls shall use "Century Line" thermoplastic wall sleeves in combination with "Link Seals" having stainless steel service designation. As manufactured by Thunderline Corporation, or the Metraflex Company, "or approved equal".

### **2.07 NON-SHRINK GROUT**

- A. Upcon High Flow, The Upco Company, Cleveland, Ohio; Masterflow 713, The Master Builder Company, Cleveland, Ohio; Duragrout, L & M Construction Chemicals, Inc., Omaha, Nebraska.

### **2.08 PIPE SIGNAGE**

- A. Brady, B-946, custom legend, self-sticking markers, and arrows or equal.

## **PART 3 EXECUTION**

### **3.01 PIPE INSTALLATION**

- A. Pool Pipe Trench Excavation
  - 1. General:
    - a. Excavation for all pool systems and related piping shall comply with the following:
      - 1) Division 31 Earthwork Specifications for buried utilities.
      - 2) Project Geotechnical Report requirements for pipe trench preparation, backfilling, and engineered fill.
      - 3) Current OSHA criteria and regulations.

- b. See pool pipe plans for additional piping details, notes/requirements, pipe routing, material types and sizes.
    2. Pipe Trench Requirements: Excavate pool piping trenches to proper depths for pool operations, required pipe slopes, and a minimum final cover plus backfill depth of 36-inches. Trench widths shall be minimized as indicated in the Pool Drawings "Typical Pool Pipe Trench Detail" and as required for proper compaction. Maintain a clear trench width of 6 to 12-inches beyond the nearest pipe wall. Maintain a minimum of 6-inches between each adjacent pipe. Protect the soils adjacent to the trench to maintain an undisturbed condition for optimal pipe support.
    3. Pipe Trench Foundation/Subbase: The trench bottom shall be smooth and free from large dirt clods, frozen material, and stones greater than 1.5-inches in diameter. A subbase is necessary only when native subgrade soils are unstable. For such conditions, over excavate the subgrade soils and place a layer of supportive engineered fill material as the trench subbase. Compact subbase materials to provide a firm foundation for the subsequent pipe embedment materials. Match the compaction effort specified in the Final Backfill layer of the pipe trench.
- B. Pool Pipe Bedding & Backfill
  1. Embedment Zone: Controlled placement of pipe trench materials is required in the embedment zone for pipe performance and to minimize deflection. Schedule inspections prior to the backfilling as needed, however backfilling the embedment zone should follow pipe assembly as closely as possible to protect the pipe from falling debris, minimize the possibility of flooding an open trench and avoiding shifting pipe. See Part 2 PRODUCTS for material specifications and assure selected embedment zone materials are free from dirt clods, clay, frozen materials, and rocks greater than 1.5-inches in diameter. Place materials in six-inch lifts in the following three subzones:
    - a. Bedding: Place six inches of supportive, compacted bedding materials beneath the pool piping to provide uniform longitudinal support under the pipe, prevent low spots, and to set piping to the proper grade. Do not use blocking of any type to bring the pipe to grade. If the native trench soil is comprised of fine grain soils and migration of those soils into the bedding material is anticipated, a well-graded bedding material without voids or a fabric barrier should be used to avoid compromising the trench backfill materials. Consult the Geotechnical Report for specific recommendations.
    - b. Haunching: Haunching is required from the bottom of the pipe to the centerline of the pipe ("springline"). To provide resistance to pipe deflection compaction of the haunching zone is required prior to placement and compaction of the initial and final backfill. Place the haunching materials by hand to give effective support of the pipe. Compact materials using shovel slicing and/or firmly tamping the materials under the pipe haunches, around the pipe, up to the spring-line of the pipe and out to the trench walls. If automatic tampers are used, avoid contacting and damaging the pipe. Control haunching to avoid vertical and horizontal displacement of the pipe from proper alignment.
    - c. Initial Backfill: The initial backfill extends from the pipe springline to a point above the top of the pipe. Place the initial backfill in 6-inch maximum loose lifts to a 12-inch minimum depth of cover above the pipe. Using small handheld or walk behind vibratory plate tampers, compact the initial backfill zone to a level no higher than  $\frac{3}{4}$  of the pipe diameter, taking care not to contact the pipe/s. Do not compact the initial backfill layer directly above the pipe.
  2. Final Backfill: This zone extends from the top of the initial backfill to the top of the trench and up to final grade. Adjust final grades as required to allow for landscaping, flatwork, or roadwork materials if applicable. Place materials for this zone using materials and compaction efforts in accordance with the Geotechnical Report and/or Division 31 Specification requirements. If those requirements are not provided, place materials in accordance with the following:
    - a. +/- 2% of the optimum moisture content
    - b. 12-inch maximum lifts, as measured in loose thickness.

- c. Uniformly compact each lift to a minimum of 95 percent of the material's ASTM D-1557 Modified Proctor Maximum Dry Density, prior to placement of subsequent lifts.
- d. Place each subsequent lift and compact in a similar manner until achieving proposed finished grades.
- e. Final cover plus backfill materials shall measure a minimum of 36-inches above the top of the pipe/s unless noted otherwise on the plans or details.

C. Piping Placement and Use

1. Base Bid shall be on pipe materials shown. See the PL Drawings and associated schedules for required pipe material types.
2. All material transitions shall be above-grade, flange to flange connections and include ribbed EPDM type rubber gaskets. Below-grade materials transitions will not be allowed unless approved by Engineer and Client and meeting special transition fittings within these specifications.
3. Piping must be laid on a grade so it will drain completely by gravity. In all instances where gravity drainage is not provided, the contractor shall install drain valves so that all lines can be drained completely. Shop drawings will be required on any such installation.
4. No installation shall be made that will provide a cross connection or inter-connection between distribution supply for drinking purposes and the swimming pool that will permit a backflow of water into the potable water supply.
5. Inspect pipe for defects before installation. Clean the interior of pipe thoroughly of foreign matter and keep clean during laying operation. Pipe shall not be laid in water or when trench conditions are unstable. Water shall be kept out of the trench until the pipe is installed. When Work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substance will enter the pipes or fittings.
6. All gutter lines shall drain by gravity to the surge tank.
7. All above grade outdoor piping shall be painted, in accordance with the manufacturer's recommendations, to protect against ultraviolet degradation.

D. PVC/CPVC Pipe & Fittings Installation

1. General: All PVC pipe connections shall be flanged or solvent welded. PVC welding is not allowed without prior approval of the Architect/Engineer. Refer to ASTM D 2855, Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings for the basic techniques and requirements for making solvent cement pipe joints. Make adjustments as required to the methods and tools used according to size of piping. Consistent, quality joints in PVC and CPVC piping products requires the following:
  - a. The joining surfaces of pipe and fitting must be softened and made semi-fluid.
  - b. Sufficient cement must be applied to fill the gap between pipe and fitting.
  - c. Assembly of pipe and fittings must be made while the surfaces are still wet and fluid.
2. Cutting the Pipe: Cut all pipe to a square face using mechanical cutting tools designed for plastic pipe. To ensure that the pipe is cut square, use a miter box when cutting with a saw. Do not damage pipe during cutting process. If damage or cracking is evident, cut off at least 2" of the pipe beyond any visible crack.
3. Deburring & Beveling: Remove all burrs and filings from the outside and the inside of the pipe using a suitable deburring/chamfering tool. Chamfer the outside end of the pipe to ease entry of the tube into the socket and minimize the chance of cement being wiped off the fitting.
4. Threaded joints: Threaded joints may be required to some equipment or special fittings. When required, after cutting and before threading, the pipe shall be reamed and shall have burrs removed. Screw joints shall be made with graphite or inert filler and oil or with an approved graphite compound applied to male threads only. Threads shall be full-cut and not more than 3 threads on the pipe remained exposed. Use Teflon II tape on the male threads of all threaded pipe joints. Caulking of threaded joints to stop or prevent leaks will not be permitted. Unions shall be provided where required for disconnection of exposed piping. Unions will be permitted only where access is provided.

5. Solvent Cementing Assembly: Solvent welding shall be made in accordance with the manufacturer's printed instructions and the following minimum standards:
  - a. All fittings shall fit easily on the pipe before applying cement. The outer surface area of pipe and inner wall of fitting shall be dry and clean. Cleaner is to be applied to the outer surface of the pipe and to the inner surface of the fitting. Cement is to be applied to the outer surface of the pipe, or on the male section of fittings only. When the outside surface area of the pipe is satisfactorily covered with cement allow ten (10) seconds open time to lapse before inserting pipe end into fittings. After full insertion of pipe into fitting, turn fitting about the pipe end approximately 1/8 to 1/4 of a turn. Wipe off excess cement at the joint in a neat cove bead. Follow manufacturer's instructions on solvents. Remove all debris, including, containers, brushes, applicators and other items from premises, dispose of properly. Burying of debris on site is not permitted.
  - b. In addition to the requirements outlined above, the solvent weld process for pipe sizes of 6" diameter and larger includes additional requirements outlined below. As pipe diameter increases, so does the difficulty in installing it. Follow all of the solvent weld manufacturer's recommendations for larger diameter pipe.
    - 1) The installer shall use proper size applicators to ensure enough cement is applied to fill the larger gap that exists between the pipe and fittings.
    - 2) Use the applicable cement for the size of pipe and fittings being installed.
    - 3) Provide adequate crew size to properly handle and fit pipe installations.
    - 4) It is important in large diameter joining that the primer and cement be applied simultaneously to the pipe and fittings. Apply a second, full layer of cement to the pipe. Pipe must be bottomed into the fitting.
    - 5) Large diameter pipe and fittings require longer set and cure times. Prefabricate as many joints as possible. If pipe is to be buried, fabricate as many joints as possible above ground, after joints have cured, carefully lower into trench.
  - c. Follow manufacturer's recommendations for specific product/application set time and cure time requirements. All joints shall remain completely undisturbed for a minimum of 10 minutes from time of jointing the pipe and fitting. If necessary, to apply pressure to a newly made joint, limit to 10% of rated pipe pressure, during the first 24 hours after the joint has been made.
  - d. Make provisions for expansion and contraction by way of swing joints or snaking.
  - e. Protect plastic pipe from exposure to aromatic hydrocarbons, halogenated hydrocarbons, and most of esters and ketones that attack the material. Protect all pipe from mechanical damage and long exposure to sunlight during storage.
- E. Field Coordination
  1. It is the Contractor's responsibility to provide piping by means that account for all necessary coordination, including, but not limited to: water stops, oversize sleeves, pipe supports, valves and other attachments, over-excavations required for fusion machinery or other equipment, etc.
  2. Provide pipe extensions and temporary caps necessary for pressure testing requirements.
  3. Contractor is required to provide coordination and adequate protection as needed to all external services (i.e., ducts, pipes, cables) that run throughout the project site. Plumbing shall be located and placed to prevent damage during and after construction from traffic loads above.
- F. Overhead piping in mechanical room/pool room shall be run such that a minimum head clearance of 7'-0" is observed to all piping, pipe fittings and pipe hangers/supports. Piping runs shall not create path obstruction or a tripping hazard.
- G. Pipe Identification
  1. Provide identification on all piping located in mechanical equipment, chlorine, acid rooms, heater courts, etc.
  2. All piping in Mechanical Room to be labeled with description of line and arrows indicating direction of flow.

3. Mark at least once on each line and at 5 ft. intervals minimum. Consult Health Department Code for minimum marking requirements.
4. Color code per Health Department requirements. If code does not identify color coding requirements consult Architect/Engineer.

**3.02 SLEEVES AND WALL PENETRATIONS**

- A. Patch exterior side of wall penetrations with non-shrink grout. Other methods of water tightness shall be pre-approved by the Architect/Engineer.

**3.03 PRESSURE TESTING**

- A. Pressure test all piping in accordance with Part 1.04B. requirements.
- B. Submit pressure test records to Engineer/Architect in accordance with Part 1.04B. requirements.

**END SECTION**

**131123  
POOL PIPE SUPPORTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe Hangers & Supports.

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Product data including manufacturer's specifications, installation instructions.
- C. Shop Drawings showing type and locations.

**1.04 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Refer to General Requirements and Division 01.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Hangers and Supports
  - 1. General
    - a. All hangers, pipe supports, threaded rod, hardware, etc. shall be hot-dipped galvanized steel, ASTM A123, or type 304 stainless steel or better grade.
    - b. All piping connections and support hardware inside surge tanks and gutters shall be stainless steel.
  - 2. Strut
    - a. Minimum height 1 5/8", minimum width 1 5/8", minimum thickness 12-gauge material.
    - b. Finish shall be hot-dipped galvanized steel, ASTM A123; or type 304 stainless steel or better grade, ASTM A240.
  - 3. Strut Clamps
    - a. Pipe sizes 1/2" thru 12", two-piece clamps with clamping bolt and nut. Pipe sizes 14" and larger, provide "U" bolts, nuts and washers.
    - b. Finish shall be hot-dipped galvanized steel, ASTM A123; or type 304 stainless steel or better grade, ASTM A240.
  - 4. Strut Accessories
    - a. Flat plate fittings, corner braces, post bases, etc. Finish shall be hot-dipped galvanized steel, ASTM A123; or type 304 stainless steel or better grade, ASTM A240.
  - 5. Wedge Anchors
    - a. One-piece assembly, 3/8" minimum body diameter.
    - b. Grade 2, hot-dipped galvanized steel anchors and clips, ASTM A123; or type 304 stainless steel or better grade, ASTM A240.
  - 6. Beam Clamps
    - a. Steel "C" clamp type with locknut.
    - b. Finish shall be hot-dipped galvanized, ASTM A123; or type 304 stainless steel or better grade, ASTM A240.
  - 7. Support Components

- a. All threaded rod, threaded rod couplings, nuts, washers, etc. Finish shall be hot-dipped galvanized, ASTM A123; or type 304 stainless steel or better grade, ASTM A240.
8. Exposed/cut Ends: All galvanized channel supports or other metallic pipe support hardware that is cut shall be field treated to cold galvanize over all exposed/compromised areas with a 95% zinc rich paint to a 1.0 to 3.0 mil thickness.
- B. Locations
  1. In the Pool/Waterpark/Natatorium Room: All piping supports, connections and support hardware shall be type 304 stainless steel or better grade, ASTM A240.
  2. Inside Surge/Collector Tanks & Gutters: All piping supports, connections and support hardware shall be type 304 stainless steel or better grade, ASTM A240.
  3. In the Pool Mechanical Room: All piping supports, connections and support hardware shall be hot-dipped galvanized, ASTM A123; or type 304 stainless steel or better grade, ASTM A240.
  4. Pump Support Pads: All pump equipment pad support channels and anchor hardware shall be type 304 stainless steel or better grade, ASTM A240.
  5. Pool Chemical Rooms: All piping supports, connections and support hardware shall be fiberglass or type 304 stainless steel or better grade, ASTM A240.
  6. Exterior Locations: All piping supports, connections and support hardware installed outside and exposed shall be hot-dipped galvanized, ASTM A123; or type 304 stainless steel or better grade, ASTM A240.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. All mechanical room piping must be properly supported using the schedule indicated on the drawings as a guideline for maximum allowable spacing between supports.
- B. It shall be the contractor's responsibility to properly support piping at all valves, pumps, equipment, overhead areas, and changes in direction.
- C. All piping must be supported laterally as well as vertically hung.
- D. Ring, clevis, roller, and J hook type hangers are not acceptable.
- E. Exposed/cut Ends: All galvanized channel supports or other metallic pipe support hardware that is cut shall be field treated to cold galvanize over all exposed/compromised areas with a 95% zinc rich paint to a 1.0 to 3.0 mil thickness.
- F. Comply with manufacturer's written instructions.

#### **END SECTION**



**131124  
POOL VALVES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Butterfly Valves
- B. Ball Valves
- C. Check Valves
- D. Expansion Joint/Flexible Connector
- E. Modulating Electrical Main Drain Valves
- F. Submerged Service Operators
- G. Valve Operator Extension
- H. Drainage Valves
- I. Reducers

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 REFERENCES**

- A. The following latest edition reference specifications, guides and standards shall become part of this Specification as if herein written. If provisions conflict, the more stringent provisions shall apply.
  - 1. ANSI – American National Standards Institute
  - 2. ASTM – American Society of Testing Materials

**1.04 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Submit Shop Drawings, clearly indicating make, model, location, type, size, pressure rating, and type of service.
- C. Valve charts
  - 1. Submit two copies of valve charts for each piping system, consisting of isometric Drawings, or piping layouts showing and identifying each valve and describing its function to the Architect/Engineer for approval.
  - 2. Upon completion of the Work, one copy of each valve chart sealed to rigid backboard with clear lacquer, placed under glass and framed, shall be hung in a conspicuous location in the equipment room.

**1.05 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Refer to General Requirements and Division 01.

**1.07 WARRANTIES**

- A. Standard Manufacturer's Warranty

**PART 2 PRODUCTS**

**2.01 GENERAL**

- A. Cast Iron valves 3" and larger shall have an epoxy coated body on all interior and exterior surfaces, ductile iron-nylon II coated disc, one piece 416 stainless steel shaft with Buna-N or EPDM seat minimum, 150 PSI rating, or cast aluminum ASTM S12A housing and fully coated

with Rilsan on all interior and exterior surfaces. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and T304 stainless steel shaft. 150 psi rating.

- B. Cast Aluminum valves 3" and larger shall have an ASTM S12A body and coated with Rilsan on all interior and exterior surfaces. Internal components include Buna-N or EPDM resilient lining and seat, Rilsan coated ductile iron disc and T304 stainless steel shaft. 150 psi rating.
- C. Thermoplastic valves 3" and larger shall be constructed from PVC Type 1 Cell Classification 12454 or CPVC type 4 cell classification 23447. Thermoplastic valves shall include PVC disc with solid type 316L stainless steel shaft with Buna-N or EPDM seat pressure rated to 150 psi @ 73 degrees Fahrenheit.

## 2.02 BUTTERFLY VALVES

- A. Butterfly valves 3" - 12" shall be wafer or lug bodies and shall be suitable for use between ANSI 125 and 150 lb. flanges.
- B. Bodies of the flangeless design shall be provided with at least two bolt guides to center the valve in the pipeline.
- C. All valves shall be as manufactured by Bray Valve, Dominion, Asahi/America, or equal.
- D. All bolts and, nuts and washers shall be corrosion resistant hot-dipped galvanized, ASTM A123 or type 304 stainless steel with plated washers to be used when secured to PVC flanges.

## 2.03 UV LAMP STRAINER VALVE

- A. EZ Strainer 4" to 12" butterfly type valve with stainless steel strainer disc and shaft, case aluminum Rilsan (nylon) coated valve housing, with manual locking valve handle as manufactured by Neptune Benson. Install on downstream side of UV lamp per UV installation details.

## 2.04 BALL VALVES

- A. PVC True Union Ball Valves, Ipex, Asahi, Spears or equal.

## 2.05 CHECK VALVES

- A. ½" thru 2 ½" shall be PVC body, true union, ball type, seal material EPDM as manufactured by Ipex, Asahi Spears or equal as indicated on Contract Drawings.
- B. 3" thru 20" diameter check valves:
  - 1. Type: Split disc wafer style
  - 2. Valve Body: Ductile or cast iron with an epoxy painted exterior
  - 3. Lining: Fully lined with a Buna N elastomer
  - 4. Shaft: 316 stainless steel shaft and shaft plug
  - 5. Plates: 316 stainless steel (3" – 12") or Aluminum Bronze (14"+)
  - 6. Spring & Plate Travel Stop: 316 stainless steel
  - 7. Manufacturer: Center Line Series 800 as manufactured by CRANE ChemPharma & Energy, or Model CVXXK Series by Metraflex, or approved equal.

## 2.06 EXPANSION JOINT/FLEXIBLE CONNECTOR (WHERE REQUIRED)

- A. Shall be the Metrasphere, Style R with EPDM body and threaded bolt holes, Model #MSREE Series manufactured by Metraflex, as indicated on drawings. Install with a control unit assembly (tie rods) from flange to flange per manufacturer's instructions to minimize expansion joint damage caused by excessive motion.

## 2.07 MODULATING ELECTRONIC MAIN DRAIN VALVES

- A. The modulating electronic main drain valves shall be assembled and installed as specified in the Contract Drawings. The purpose of the valve is to use the surge tank and/or balance tank water level as a means of electronically adjusting and controlling the flow from the pool main drain plumbing.
- B. Provide and install equipment as detailed in the Contract Drawings and as follows:

1. Surge tank water level sensor and transmitter per descriptions below; or an approved equal:
  - a. Flowline EchoPod DL24 ultrasonic transmitter for continuous level measurement using the Chemtrol PC3000 Controller for valve control. Controller as scheduled in the Project Drawings & Section 13 11 37. Provide level sensor with the following:
    - 1) Ultrasonic transmitter for surge tank water level measurement up to 9.8'. (Note for deeper tank depths supply the DL34 for surge tank water level measurement up to 18.0'.)
    - 2) Accuracy of 0.125" to +/- 0.2% of range.
    - 3) 24VDC supply voltage.
    - 4) Type 6P encapsulated, corrosion resistant enclosure with a Viton gasket and 1" NPT fitting (DL34=2") for sensor stand-pipe mounting.
    - 5) 48" long polyurethane cable jacket.
  - b. BECSys Model SLS continuous level sensor using the BECSys Chemical Controller for valve control. Controller as scheduled in the Project Drawings & Section 13 11 37. Provide level sensor with the following:
    - 1) Piezoresistive pressure measurement of the water column.
    - 2) Automatically adjusts for changes in atmospheric pressure.
    - 3) Factory calibrated.
    - 4) Field configurable sensor length with a 4-20 mA signal output.
    - 5) Solid-state; no moving parts that can wear out over time.
    - 6) Installation options for wall mount and stand-pipe configurations.
2. Digital Processor (Basis of Design): Shall be internal with the Chemical Controller, or an approved equal. See pool mechanical and main drain detail on PL drawings for installation requirements. Program settings as shown on detail per the manufacturer's instructions. The controller shall continuously monitor, display and data log surge tank level with 10 mm (0.4") resolution or better. The controller shall also use the surge tank level to control a water makeup valve to maintain water level (Autofill) and/or control the main drain modulating valve/s.
3. Valve: One (1) butterfly valve. Valve shall be one pipe size smaller than the main drain pipe.
  - a. Type-57P PVC butterfly valve (for use with Series 19 Smart Modulating Electric Actuator by Asahi/America).
  - b. See "Butterfly Valves" within this specification section for additional valve material and manufacturer requirements.
4. Valve Positioner/Actuator:
  - a. Electronic Actuator: Provide Series 19 SAV Smart Pack Asahi Failsafe Modulating Electric Actuator. Voltage: Available in 95-265 VAC (or 24 VAC/VDC confirm with Chemical Controller Mfg, Water Level Sensor and Electrical Contractor), 0.4 to 2.0 amp draw, NEMA 4X cable gland with a 6.5-foot (2-meter) cable for connection. Asahi Model S50: Valve sizes 3" & 4" (4" & 6" main drains, respectively), 442 in-lb torque; Asahi Model S110: Valve size 6" (8" main drain), 973 in-lb torque; Asahi Model S400: Valve sizes 8" & 10" (10" & 12" main drains, respectively), 3540 in-lb torque. Actuators with less torque capacity may not be accepted.
  - b. OLED Screen with input display for input command, position status, and alert conditions and local open/close controls via password.
  - c. Space heater internally wired to limit condensation.
  - d. Electric actuator with reversing, brushless DC motor and a manual over-ride allowing to cycle valve via electroless nickel-plated hex key.
  - e. Positioner: Pushbutton calibration to plus/minus 0.1 degree within a 90-degree quadrant. See detail for range of positions. Fail position (loss of command/signal) shall be 100% closed.
  - f. Capacitor Discharge System, utilizing a capacitor in place of batteries for the failsafe mode. Battery backup system/s will not be permitted.

- g. Manufacturer: Asahi/America, Inc., [www.asahi-america.com](http://www.asahi-america.com); or equal.

## **2.08 SUBMERGED SERVICE OPERATORS**

- A. Use only approved service operators for the valve requiring underwater operation in the surge tank or in manhole used for pool draining.

## **2.09 VALVE OPERATOR EXTENSION**

- A. Extensions shall be stainless steel and by same manufacturer as the valve manufacturer.

## **2.10 DRAINAGE VALVES**

- A. Provide min. 3/4" True Union Ball valve on all piping at such a location to allow complete drainage of system.

## **2.11 REDUCERS**

- A. Use Eccentric reducers on pump suction lines only and concentric reducers on pump discharge lines only.
- B. Stainless steel body and flanges, T304 materials, ANSI 125# rated flanges.
- C. Use Neptune Benson, 15-CNS/15ECS series "or equal".
- D. Provide valves of same manufacturer throughout where possible and practical.
- E. Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.

## **2.12 VALVE LABELS**

- A. Provide and install 2" round, 1/16" thick, multi-layered valve tags with contrasting lettering with non-corrosive beaded tie on all valves. All labels shall be labeled in accordance with the valve chart per Section 13 11 14.

## **PART 3 EXECUTION**

### **3.01 VALVE CONNECTIONS**

- A. Provide valves suitable for connection to adjoining piping.
- B. Valve size shall be the same as the pipe size.

### **3.02 VALVE USE**

- A. Pipe sizes 3" - 14" – Butterfly
- B. Miscellaneous valves 1/2" – 2-1/2" - PVC True Union Ball Valves
- C. All chemical lines and equipment - PVC True Union Ball Valves

### **3.03 VALVE OPERATORS**

- A. All butterfly valves shall have gear operators and chain operators as required unless drawings indicate otherwise. Chain operators shall be required on all gear operators located 7'-0" or higher above finished floor.
- B. Provide extension lengths as necessary to operate submerged or below surface valves and the appropriate valve box access cover.

## **END SECTION**

**131125  
POOL CENTRIFUGAL PUMPS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pumps
  - 1. Flooded Suction
  - 2. Self-Priming Thermoplastic
- B. Vertical Turbine Pumps
- C. Pump Accessories
  - 1. Pump Strainers
  - 2. Gauges
  - 3. Flow meters

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 REFERENCES**

- A. The following latest edition reference specifications, guides, and standards shall become part of this Specification as if herein written. If provisions conflict, the more stringent provisions shall apply.
  - 1. Hydraulic Institute Standards
  - 2. Institute of Electrical and Electronics Engineers Standards (IEEE)
  - 3. National Electrical Manufacturers Association Standards (NEMA)
  - 4. Occupational Safety and Health Administration Rules and Regulations (OSHA)
  - 5. National Sanitary Foundation (NSF)
  - 6. American Society for Testing and Materials Standards (ASTM)
  - 7. American Iron and Steel Institute (AISI)
  - 8. American National Standards Institute (ANSI)
  - 9. ASTM A48 – Standard Specification for Gray Iron Castings
  - 10. ASTM B584 – Standard Specification for Copper Alloy Sand Castings for General Applications
  - 11. AISI 1045
  - 12. ASTM B62 – Standard Specification for Composition Bronze or Ounce Metal Castings

**1.04 DESCRIPTION OF WORK**

- A. The pumping units shall be installed in accordance with the instructions of the manufacturer and as shown on the drawings by the Architect/Engineer.
- B. Pump capacity, horsepower, TDH (Total Dynamic Head), speed, suction and discharge diameters, type, and other requirements shall be as shown on the drawings and shall comply with the requirements as specified herein.
- C. The General Conditions shall apply to this Section as fully as if repeated herein.

**1.05 QUALITY ASSURANCE**

- A. To ensure a properly integrated and compatible system, the Equipment Manufacturer shall assume full responsibility for the warranty and proper operation of the pumps, pump motors, and/or accessory equipment within this Specification.
- B. Acceptable Products and Manufacturer: ASC Pumping Equipment Inc. (West Bend, WI; Appleton, WI; & Kansas City, MO: <https://ascpump.com/>) and/or as listed on the contract documents or included herein, or an Engineer approved equal product and manufacturer.
- C. All pumps and strainers shall be NSF50 certified as provided, including required coatings, and shall be labeled as such on the serial number identification tag.

### **1.06 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Submit complete motor and pump data together with shop drawings for the driven machine. All material is to be collated in a card stock binder, with pockets for large drawings, and with index. This data shall be prepared by the motor and/or pump manufacturer and shall include:
  - 1. Pump manufacturer and model number, name of motor manufacturer, type of pump and motor with dimensioned drawings.
  - 2. Characteristic curves at full load motor speed showing flow, TDH, efficiency, horsepower, and NPSH required. For all VFD applications include a family of performance curves, separate of the full load motor speed curve, for speeds of 105%, 100%, 89%, 83%, 66%, and 50% of the scheduled RPM.
  - 3. Nominal motor horsepower, speed at full load, frame size, enclosure construction, winding insulation class and treatment, temperature rise at nominal horsepower, service factor, voltage rating (indicate if dual voltage), number of phases, frequency rating, full-load amperes at nominal horsepower for application voltage, starting code letter, or locked rotor KVA or amperes.
  - 4. Complete pump description plus material list including casings, impellers, seals, shaft, bearing frame, motor mounts, guards, base plate, exterior coating type and mill thickness
  - 5. Pump sub-base and motor riser drawings. Include dimensioned drawings of the stainless steel sub-base and the motor riser support required for each pump installation. Drawings to include plan and section views to scale showing length, width and height dimensions, material specification, and required mounting holes. Coordinate these drawings and the design of these components with the pump supplier to assure a proper and level installation for each pump/motor.
  - 6. Installation Instruction and Operation and Maintenance Manuals shall include recommended protection and maintenance required for storage prior to putting pumps in service and may be submitted any time before shipment of the pumps.

### **1.07 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to General Requirements and Division 01.

### **1.09 WARRANTIES**

- A. Manufacturer's standard pump warranty. Warranty on mechanical seals covering 100% of the cost on all parts and labor extending over the same time period as the standard pump warranty.
- B. Flooded Suction Pumps
  - 1. Pump failure of any pump component directly attributable to materials and/or workmanship within one (1) year after substantial completion shall be repaired or replaced by the pump manufacturer at no cost to the Owner.
  - 2. Motor failure of any motor component directly attributable to materials and/or workmanship within three (3) years after substantial completion shall be repaired or replaced by the pump manufacturer at no cost to the Owner.
- C. Self-priming, integral strainer pumps shall be provided with a minimum one-year warranty covering failure of any pump/motor/strainer component directly attributable to materials and/or workmanship.

## **PART 2 PRODUCTS**

### **2.01 END SUCTION, CENTRIFUGAL PUMPS**

- A. General
  - 1. Pump performance shall be optimized with provision of variable speed drives where designated in the drawings.
  - 2. Operational Pump Characteristics

- a. Engineer has the right to reject any pump with a pump curve having a design point operating efficiency more than 5% below the operating efficiency of the scheduled pump provided on the drawings.
  3. Furnish and install horizontal close-coupled end suction centrifugal pumps as specified on the Contract Drawings or as pre-approved by the Architect/Engineer.
- B. Materials of Construction:
1. Flooded Suction Pumps
    - a. Pump internal materials shall be as follows:
      - 1) Casing – Ductile Iron (ASTM A536)
      - 2) Impeller – 316 Stainless Steel
      - 3) Shaft – 316 Stainless Steel
      - 4) Shaft Sleeve – 316 Stainless Steel
    - b. Coating: All internal cast iron wetted parts shall be sandblasted and coated per the coating manufacturer's recommendations with Scotchkote 134 or equal product.
    - c. Casing
      - 1) The casing will be of the end suction design with tangential discharge outlet. For suction piping diameters of 2" or greater, the suction and discharge shall be bolt through flanged connections. Flange connections shall be ANSI 125# rated with NPT gauge tapings.
      - 2) The casing shall have tapped and plugged holes for priming and draining. The casing bore shall be large enough to allow "back pullout" of the impeller without disturbing the casing or suction and discharge piping. The casing shall be supported by casing feet to avoid pipe strain.
    - d. Impeller: The impeller shall be of the enclosed type, vacuum cast in one piece. It shall be finished all over, the exterior being turned and the interior being finished smooth and cleaned of all burrs, trimmings and irregularities. The impeller shall be dynamically balanced. The impeller will be keyed to the shaft, and fastened with 316 stainless steel washers, gasket and cap screw.
    - e. Mechanical Seal: Shaft sealing shall be accomplished by means of a John Crane Type 21 or equal mechanical seal with solid silicone carbide face/primary ring; solid silicone carbide seat/mating ring; 316 stainless drive band, retainer and spring; and Buna-N elastomers.
    - f. Shaft: The impeller shall be direct coupled to the 316SS motor shaft. The motor shaft shall be machined to provide a key way and drilled and tapped to accept the impeller fastener. Stub shafts are not acceptable.
    - g. Shaft Sleeve: The pump shaft shall be fitted with a 316SS shaft sleeve to minimize shaft wear. The sleeve shall be sealed to the impeller hub by an O-ring and shall be positively driven by a pin to the key way. The use of adhesive compounds to fasten the sleeve to the shaft shall not be accepted.
    - h. Pump / motor must mount on the same plane and preserve back-pull-out design. 304SS MOTORIZER shall be supplied when pump mounting feet and motor feet do not align.
    - i. Pump nameplate shall be engraved via computer on 316SS data plate.
    - j. Pump support:
      - 1) Concrete Pump Pad: Install a reinforced cast in place concrete pump pad for leveling purposes and to assure the motor is raised above the equipment room floor.
      - 2) Sub-base: Provide a 316SS sub-base beneath the pump and connected to the concrete pump pad to assure a level installation and support for the pump and motor.
      - 3) Motor Riser: Provide a 316SS motor riser connected to the sub-base to assure a level installation and support for the pump motor. The motor riser shall be mechanically connected to the pump sub-base support to allow removal of

- motor and pump impellor without removal of pump sub-base support or pump piping.
- 4) Manufacturer: Pump sub-base and motor riser supports fabricated/manufactured by ASC Pumping Equipment Inc.
- k. Motor
- 1) The motor shall be a NEMA-JM configuration motor meeting current NEMA Premium Efficiency Standards and shall be totally enclosed fan cooled (TEFC). NEMA –JP configurations shall only be used on large pumps (Aurora 6x8x13.5 & 8x10x13.5) only.
  - 2) The motor shall have a service factor of a least 1.15. The service factor is reserved for variations in voltage and frequency.
  - 3) Motor must be rated for use with a Variable Frequency Drive and meet the NEMA MG1 Standard, Part 30.
  - 4) Motors shall have 316SS shaft
  - 5) Motors must achieve 15:1 constant torque turndown.
  - 6) Motors shall come equipped with internal shaft grounding brush.
  - 7) Motors Frames 326 and below shall have removable feet to achieve F1, F2, & F3 field convertible conduit box position.
  - 8) Motor Conduit box shall have NPT threaded entry
  - 9) The motor shall have a sufficient horsepower rating to operate the pump at any point on the pump's head capacity curve at full load speed (60 Hz) regardless of selected operating speed without overloading the nameplate horsepower rating of the motor, regardless of service factor. Vendor shall confirm that motor current does not exceed allowable full load amperage at reduced frequency. Vendor shall verify scheduled horsepower meets above requirements. In no case shall the horsepower be less than indicated on the Drawings without specific approval from the Engineer.
  - 10) Electrical requirements including phase, frequency, and voltage are indicated on the Drawings.
2. Self-Priming Thermoplastic Pumps
- a. Pump internal materials shall be as follows:
    - 1) Casing – Thermoplastic Resin
    - 2) Impeller – Thermoplastic Resin
    - 3) Case Wear Ring – Bronze (ASTM B505)
    - 4) Shaft – Hardened Steel (AISI 1045) or Stainless Steel (ASTM A895)
    - 5) Shaft Seal – Ceramic and carbon seal faces, with stainless steel, brass, and Buna N materials in the bellows portion.
  - b. Impeller: The impeller shall be of the enclosed type, molded in one piece. The impeller will be secured to the shaft by means of a stainless-steel key and locking screw into the end of the motor shaft.
  - c. Case Wearing Ring: The pump casing shall be fitted with a diffuser. The diffuser has a bronze case wear ring to minimize abrasive and corrosive wear to the casing. The case wear ring shall be of the radial type, press fitted into the diffuser.
  - d. Shaft: The impeller shall be direct coupled to the motor shaft.
  - e. Shaft Seal: The pump shaft shall be fitted with a shaft seal to minimize shaft wear. The shaft seal shall be Ceramic and carbon seal faces, with stainless steel, brass, and Buna N materials in the bellows portion.
  - f. Motor
    - 1) The motor shall be a premium efficiency motor meeting current NEMA Standards and shall be totally enclosed fan cooled (TEFC).
    - 2) The motor must be rated for use with a Variable Frequency Drive and meet the NEMA MG1 Standard, Part 30.
    - 3) The motor shall have a sufficient horsepower rating to operate the pump at any point on the pump's head capacity curve at full load speed (60 Hz) regardless of



selected operating speed without overloading the nameplate horsepower rating of the motor, regardless of service factor. Vendor shall confirm that motor current does not exceed allowable full load amperage at reduced frequency. Vendor shall verify scheduled horsepower meets above requirements. In no case shall the horsepower be less than indicated on the Drawings without specific approval from the Engineer.

- 4) Electrical requirements including phase, frequency, and voltage are indicated on the Drawings.
- g. For pumps indicated on the contract documents to be provided with an integral VFD:
  - 1) Drive shall be UL 60730 Compliant.
  - 2) Provide manufacturer's standard control panel and communication cable.
  - 3) Control panel shall include an alarm LED and error message to alert the user of malfunctions.
  - 4) VFD shall include a programmable priming mode with automatic detection of prime for easy start-up and automatic detection of loss of prime.

## 2.02 PUMP ACCESSORIES

- A. Pump Strainers
  1. All Horizontal Pumps
    - a. Unless the pump has an integral hair and lint strainer, supply and install strainers equal to those indicated on the Contract Documents.
    - b. Provide each strainer with two strainer baskets.
- B. Gauges
  1. Provide compound gauges where called for on Drawings and as required by Code.
  2. Compound gauges shall be Liquid Filled, 30 Hg to 60 PSI with gauge cock and snubber as manufactured by Weksler, Marsh, Winters or equal.
- C. Flowmeters
  1. Provide flow meters where called for on the Drawings and as required by Code on main lines and on branch lines of flow ranges indicated.
  2. Flowmeters shall be as specified on the contract documents or approved equal.
  3. Transmitter shall have an operating voltage of 12-24VDC and meet appropriate CE, CSA & UL standards. Reading accuracy must be within +/- 0.5% of reading at 25oC. Device shall meet NEMA 4X & IP65.
- D. Pump Labels
  1. Provide corrosion-resistant, permanent pump labels with contrasting lettering.
  2. Label shall include pump ID from contract drawings and a description. (e.g. "P1A Lap Pool Filtration Pump")

## PART 3 EXECUTION

### 3.01 PUMP INSTALLATION

- A. The pumping units shall be installed in accordance with the instructions of the manufacturer and as shown on the drawings by the Pool Engineer.
- B. Ensure that the pumps and motors are properly supported and aligned with no pipe strain transmitted to the pump casing. Secure the pump and motor as recommended by the manufacturer using mechanical connections provided on the pump and motor feet. See the Pool (PL) Drawings for additional pump installation details and requirements, including concrete pump pad, sub-base, and motor riser supports. The sub-base and motor riser supports are critical for proper vertical alignment and to allow removal of motor and pump impellor without removal of pump sub-base support or pump piping. Installations of the Aurora 3801 Series end suction pump without the sub-base, and motor riser supports will not be accepted.
- C. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations.
- D. Permanently affix pump label to the pump.

**3.02 ACCESSORY INSTALLATION**

- A. Install accessories as shown on the contract documents and in accordance with manufacturer's instructions.
- B. Strainers shall be supported on a concrete housekeeping pad and provided with sufficient space for maintenance.
- C. Gauges shall be positioned to be read adjacent to the pump or from above, where pumps are in a pump pit.
- D. Field mount the flowmeter and flow meter transmitter as located and shown on the pool plans. Mount transmitter at 4-5 feet above the floor utilizing the 3-8050 universal mounting kit.
- E. Permanently affix pump label to the pump in an easily visible location.

**3.03 FACTORY TRAINED REPRESENTATIVE**

- A. Provide a factory-trained representative for the purpose of supervising installation, start-up, final field acceptance testing, and providing instruction to the owner's operating personnel in the proper operation and maintenance of the equipment in this section.
- B. Contractor and factory-trained representative shall verify pump flow aligns with the pump curve and calibrate flowmeter as required.

**END SECTION**

**131126  
POOL PUMP VFD**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. Work Includes:
  - 1. Furnish all labor, materials, tools, and equipment, as indicated, in accord with provisions of Contract Documents.
  - 2. Completely coordinate with work of all other trades.
  - 3. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- B. General:
  - 1. See Section 26 0001 for General Electrical Requirements.
  - 2. See Division 1 for General Requirements.
  - 3. Coordinate all requirements with Contractor providing equipment including but not limited to contacts bypass and controls.

**1.02 RELATED WORK**

- A. Section 26 05 26 – Grounding and Bonding
- B. Section 26 05 53 – Electrical Identification
- C. Section 26 28 13 – Fuses
- D. Section 26 28 16 – Enclosed Switches

**1.03 REFERENCE STANDARDS**

- A. ANSI/IEEE 519 Guide for Harmonic Control and Reactive Compensation of Static Power Converters.

**1.04 SUBMITTALS**

- A. Submit shop drawings and product data under provisions of Division 01, General Conditions of the Contract, and Section 26 0001.
- B. Include physical, electrical, and performance characteristics of each variable frequency drive and associated components, including dimensions; weight; input and output performance; voltage, phase, current and overcurrent characteristics; installation instructions; protective features; wiring and block diagrams indicating specified options; electrical noise attenuation equipment where required to meet the criteria specified; line side voltage notch wave form and line side current harmonics; certified efficiency versus load and speed curves; and required operating environment.

**1.05 OPERATING AND MAINTENANCE INSTRUCTIONS**

- A. Submit operation and maintenance data under provisions of Section 26 0001 and Division 01.
- B. Instructions to include recommended maintenance procedures, maintenance schedules, recommended spare parts list, and vendor name for those parts.

**1.06 EQUIPMENT STARTUP AND AGENCY TRAINING**

- A. Provide the services of a factory trained and certified technician to approve the installation; start-up, test, and adjust for proper operation; and instruct and train the Agency's representative in the operation and maintenance of the unit(s). Upon completion of the equipment startup, submit a complete manufacturer's field report, including startup and test log, signed by the factory trained technician. Coordinate with other Contractors as required. The startup shall be completed within ten (10) working days from the startup date.

**1.07 WARRANTY**

- A. The warranty shall be for a period of 36 months applied from the date of project Substantial Completion, but not to exceed 42 months from shipment. Further, the warranty shall include all parts, labor, travel time, administrative costs, overhead, travel expenses, technical support and any and all other costs to provide the warranty service.

#### **1.08 COORDINATION**

- A. All line voltage power wiring to equipment, factory mounted control panels, to motor control centers, to and from disconnect switches, and to individually mounted starters, and from starter to motors, shall be provided by the Electrical Contractor.
- B. Vendor/Contractor that specifies "starters by Electrical Contractor" shall furnish project specific wiring diagrams to Electrical Contractor for all equipment and devices furnished by this Contractor and indicated to be wired by the Electrical Contractor. In addition, furnish complete sets of wiring diagrams for Owner's bound maintenance manual.
- C. All line, or low voltage, wiring which is not indicated on the drawings, or specified, but necessary to complete the installation, shall be provided by this Division.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. ABB 580 Series
- B. Alternate manufacturer's requests shall be submitted in writing to the Engineer for approval at least 20 working days prior to bid. A compliance list point by point to this specification shall be provided. Factory authorized local support for service for warranty shall be identified.

#### **2.02 DESIGN AND CONSTRUCTION**

- A. The unit shall be variable torque, modular design for control of the motors and rated at the motor full load nameplate amps.
- B. The unit shall be UL 61800-5-1 listed, solid state, micro processor-based with a pulse width modulated (PWM) output wave form (none others are acceptable).
- C. The VFD shall employ a full wave bridge rectifier, to prevent line notching, with dual DC bus chokes, capacitors to minimize the ripple of the rectified voltage to maintain near constant DC voltage. Insulated gate bipolar transistors (IGBT's) shall be employed as the output switching device.
- D. Control circuitry shall be plug-in, plug-out modular basis with a corrosion resistant coating on printed circuit boards.
- E. Units to be suitable for an operating environment from 0°C to 40°C temperature and humidity up to 95% non-condensing. The VFD shall be rated to Class 3S2 Pollution degree 2 according to IEC/EN 61800-5-1. The entire VFD package shall be UL listed at 100KA SCCR.
- F. Electrically and physically isolate control circuitry and conductors from power circuitry and power conductors. Control conductors and power conductors shall not be run in the same conduit.
- G. The unit enclosure shall be UL Type 12 (IP55) enclosure for the application minimum. All components shall be factory assembled and tested prior to leaving the manufacturing facility.
- H. Include the following operating and monitoring devices mounted on the front cover:
  - 1. Fused disconnect switch with door interlocked handle and lock-open padlocking provisions (VFDs with no bypass).
  - 2. Operating mode selector switch marked "hand-off-auto". Manual speed adjustment via keypad, mounted on the door.
  - 3. Manual bypass selector switch to select power through drive or bypass where indicated on drawings. A main door interlocked, thermal magnetic circuit breaker (pad lockable, door interlocked) and VFD exclusive fuses on all drives with bypass
  - 4. Pilot light marked "RUN".

- I. Provide a manual bypass circuit and bypass starter to transfer from variable frequency drive operation to bypass operation where indicated on drawings. When no bypass is required, a door interlocked, padlockable disconnect and fast acting fuses are to be provided.
- J. Provide partitioning within drive enclosure to separate and isolate bypass section from variable frequency drive section and to house bypass wiring, contactors, relays, and manual bypass circuit so that devices within the converter/inverter compartment are able to be serviced without electrical danger to the service technician.
- K. Starters shall have provisions for additional control requirements such as, but not limited to inputs and outputs for connection to external relays and equipment where required.

### **2.03 PERFORMANCE REQUIREMENTS**

- A. Units shall be suitable for input power of electrical system as scheduled on the drawings  $\pm 10\%$  to 15%, 3 phase, 60 Hertz nominal. The VFD shall operate with line voltage +30% and -35%. All faults shall be selectable for manual or auto restart. The VFD shall detect when a motor disconnect is open and disable the VFD.
- B. Provide minimum 5% line reactor in each AC phase on the input side or 5% dual DC bus reactors to reduce harmonic voltage distortion. Limit line noise, as measured at the point of common coupling, to a voltage factor of 5% or less as defined in IEEE-519, latest edition. If the distortion is greater than that allowed by IEEE-519, latest edition, the line reactor shall be changed in size to ensure compliance. The supplier of the VFD shall provide distortion calculations to be used for setup and analysis.
- C. Use a current limiting control device to limit output current to 110% continuous for one minute; also refer to Protection Features in this section. Full load output current available from drive shall not be less than motor nameplate amperage. The full load amp rating of the VFD shall not be less than the values indicated in the NEC Table 430-150.
- D. Output power shall be suitable for driving standard NEMA B design, three phase alternating current induction motors at full rated speed with capability of 10:1 turndown.
- E. Additional performance capabilities to include the following:
  - 1. Ride through a momentary power outage of 15 cycles.
  - 2. Short circuit and ground fault output protection (power applied only and running).
  - 3. Start into a rotating load without damage to drive components or motor.
  - 4. Capable of automatic restart into a rotating load after a preset, adjustable time delay following a power outage.
  - 5. Programmable time delay following a run command.
  - 6. Input power factor: Min 0.95 throughout the speed range.
  - 7. VFD's shall have a UL listed Short Circuit Withstand Rating of 65,000 AIC.
  - 8. Minimum efficiency: 95% at 100% speed, 85% at 50% speed.

### **2.04 CONTROL FEATURES**

- A. Use control circuits compatible with input signal from control system in the automatic mode and from manual speed control in the manual mode. Vary motor speed in response to the input control signal. Include components necessary to accept the signal from the control system in the form that it is sent. Coordinate with Vendor/Contractor supplying control system and or motor.
- B. Include the following additional control features:
  - 1. Hand-Off-Automatic (HOA) selector switch to select local or remote start/stop and speed control.
  - 2. Analog input, selectable 0-10v or 4-20 mA, for automatic control from a compatible control system. Include an RS-485 port with BACnet protocol. The drive shall be BTL Listed to Revision 14 or later. Use of non-BTL Listed drives are not acceptable. The VFD shall also include a certified PROFINET communication port. Local speed control at the VFD.
  - 3. Local speed control at the VFD.

4. Adjustable acceleration and deceleration rate so that the time period from start to full speed and from full speed to stop can be field adjusted.
5. Adjustable minimum and maximum speed settings for both automatic and manual modes of operation.
6. Three (3) sets of programmable form "C" contacts for remote indication of variable frequency drive condition. Note: default programming to be set for "Drive Run & Fault".
7. Illuminated display keypad. VFD that use codes are not acceptable.
8. External Fault indicator in English that is programmable (i.e. "motor disconnect open").
9. One (1) input for a N.O. dry contact type input for a 2-wire remote start/stop.
10. One (1) input for a N.C. dry contact type input for external faults: (freezestats, fire alarm, smokes, etc). This input shall be factory wired to prevent both the VFD and bypass starter operation when external fault is present.
11. Jumpered terminals for remote "Emergency Stop" controls.
12. Provide Safe Torque Off circuit according to EN 61800-5-2: 2016, IEC 61508 Parts 1-2:2010, ISO 13849-1:2015, ISO 13849-2:2012, IEC 62061:2015 SIL 3/PL shall be provided in the base VFD.
13. The VFD shall accept a N.O. dry contact that will change the control from a speed follower signal to a PID control. Actual flow and set point shall be displayed on two lines of the keypad. The flow shall be labeled GPM.

## 2.05 PROTECTION FEATURES

- A. Use electronic protection circuitry in the power circuits to provide an orderly shutdown of the drive without blowing fuses or tripping circuit breakers and prevent component loss under the following abnormal conditions:
  1. Activation of any safety device.
  2. Instantaneous overcurrent and/or over voltage of output.
  3. Power line overvoltage and undervoltage protection.
  4. Phase loss.
  5. Single and three phase short circuiting.
  6. Ground faults.
  7. Control circuit malfunction.
  8. Over temperature.
  9. Output current over limit.
- B. Provide the following additional protective features:
  1. Input transient overvoltage protection up to 3000 volts per ANSI 37.90A; Coordinated AC transient surge protection system consisting of 4 MOVs (phase-to-phase and phase-to-ground), a capacitor clamp, and internal chokes. The MOVs shall comply to UL 1449 4th Edition;
  2. DC bus fusing or other electronic controls which limit the rate of rise of the DC bus current and de-energizes the drive at a predetermined current level;
  3. Where a control transformer is part of the assembly, provide using for the control circuit transformer;
  4. Grounded control chassis; and
  5. Devices and/or control circuitry to ensure that the variable frequency drive and bypass starter are not both energized and driving motor simultaneously.
  6. Motor heating function to prevent condensation build up in the motor. Motor heating adjustment, via parameter, shall be in "Watts."
- C. Provide the following additional protective features:
  1. Coordinated AC transient surge protection system consisting of 4 MOVs (phase-to-phase and phase-to-ground), a capacitor clamp, and internal chokes. The MOVs shall comply with UL 1449 4th Edition. Drives that do not include coordinated AC transient surge protection shall include an external TVSS/SPD (Transient Voltage Surge Suppressor/Surge Protection Device).

## 2.06 DIAGNOSTICS

- A. Provide an English character display (no error codes) with indicators for the following:
  - 1. Phase Loss
  - 2. Ground Fault
  - 3. Over Current
  - 4. Over Voltage
  - 5. Under Voltage
  - 6. Over Temperature
  - 7. Overload
  - 8. DC Buss Status
- B. Keypad to have Bluetooth interface with a free phone app that has all the functions the keypad does. There shall be a built-in time clock in the control panel with 10-year battery backup. The calendar and timeclock can be used for programmed start/stop and other functions. Bluetooth connectivity shall allow uploading, downloading, and emailing of parameters.

## 2.07 QUALITY ASSURANCE TESTS

- A. Use a factory heat stress test to verify proper operation of all functions and components under full load. Each VFD shall be tested on a motor load. Test results to be provided.
- B. Field performance test of variable frequency drives to determine compliance with this specification will be performed at the owner's discretion and may include any specified feature, including operation of protective devices through a simulated fault. Contractor will pay for initial testing. Should drive be found deficient by this testing, drive manufacturer will be required to make any and all changes necessary to bring unit(s) into compliance with the specified performance and demonstrate this performance by retesting. Cost of changes and retest will be by this contractor.
- C. Variable frequency drive manufacturer or designated representative to perform a field test of each drive, in the presence of the owner's representative, for the following items:
  - 1. Provide general inspection to verify proper installation;
  - 2. Demonstrate drive reaction to simulated power interruptions of two seconds and sixty seconds;
  - 3. Demonstrate adequate protection during switching from variable frequency drive operation to bypass starter operation and back again;
  - 4. Measure and record voltage distortion factor and line notch depth at the point of common coupling. Provide the recorded value as part of the startup report.

## 2.08 BYPASS EQUIPMENT

- A. Bypass Starters:
  - 1. See Equipment schedule in drawings and provide bypass starters where indicated.
  - 2. The bypass starters shall be across-the-line magnetic starter type. There shall be a VFD-Off-Bypass selector switch or keypad that shall be separate from the VFD keypad. The bypass shall have a separate power supply from the VFD. The bypass control circuit shall include its own H-O-A switch to run in bypass without an external run command. The bypass shall be able to operate with the VFD removed for service.
- B. Bypass Configuration:
  - 1. Provide one main fused disconnect switch or circuit breaker to isolate both the drive and bypass circuit. Bypass configuration shall consist of one input drive contactor or disconnect, one output drive contactor and one output bypass contactor. The two output contactors shall be mechanically and electrically interlocked.
- C. Provide motor overload protection in the bypass circuit.
- D. Provide high speed fuses for the VFD (not in the bypass circuit). The VFD and bypass shall be UL listed for 100KA SCCR.

## 2.09 LINE REACTORS

- A. Line reactors shall be installed in each phase of the AC input side of the VFD and mounted within a common enclosure with the VFD.
- B. Line reactor shall be a three-phase inductor, 5% impedance, iron core, 600V, Class H insulation, 115 degree C rise, copper windings with screw type terminal blocks.

### **PART 3 EXECUTION**

#### **3.01 VARIABLE FREQUENCY DRIVES**

- A. Install where indicated on drawings and in accordance with approved submittals and manufacturer's published recommendations. Installation to be by the Division 26 contractor.
- B. Input wiring shall be installed in a separate conduit system, output wiring shall be installed in a separate conduit system and control wiring shall be installed in a separate conduit system. Do not mix input power, output power, or control wiring in a common conduit.
- C. Control signal for drive will be provided as indicated on drawings.
- D. VFD manufacturer to perform a field test of each drive and provide Owner operational and maintenance training.

#### **3.02 REMOTE EMERGENCY STOP**

- A. Factory jumper shall be removed from VFD Emergency Stop terminals. Terminals shall be wired to emergency stop pushbuttons as shown on the plans. Feature shall be programmed for Manual Reset that must occur at the VFD. VFD shall not automatically reset when emergency stop pushbuttons are reset. Remote Emergency Stops shall be furnished and installed by electrician – coordinate location, conduit and wiring with electrical.

### **END SECTION**



**131130**  
**POOL REGENERATIVE MEDIA FILTERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pool Regenerative Media Filter and all filter related components required for the proper operation of the filter system.

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 QUALITY ASSURANCE**

- A. The equipment described herein shall be products of a manufacturer regularly engaged in the fabrication of filtration and recirculating systems for at least fifteen (15) years and shall be a professional engineering corporation.
- B. The owner requires that filters bear the National Sanitation Foundation (NSF) seal for Standard #50. This NSF listing is required by the owner regardless of local health department regulations.
- C. The "EQUIPMENT SUPPLIER" shall be Neptune Benson.

**1.04 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Provide detailed shop drawings of the items of equipment being provided, indicating the dimensions, material of the filter tanks, valves, actuators, RMF programmer & accessory components.
- C. Provide a complete set of operating instructions, embracing the operational functions and recurring maintenance processes involved in connection with the complete filtration system.

**1.05 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.
- B. All substitutions shall be submitted using the appropriate substitution request forms as provided under the substitution section in the project manual.
- C. Voluntary Alternates for Filtration System
  1. Purpose of the bid is to purchase and have installed a complete operating filtration and recirculation system for the swimming pool. It is intended to limit the bidding to a style of product and company that has a proven history and record of performance.
  2. Due to the specialized nature of certain components required for this project, these specifications, in some instances, refer to various components by trade or manufacturers name.
  3. Whenever a proprietary (trade) name is used within this Specification Section, it is used for informational purposes to describe a standard of required function, dimension, appearance and quality. References to materials by trade name, make or model number shall not be construed as limiting competition. All bidders are required to bid on the named manufacturer in the BASE BID.
  4. Other treatment systems will be considered only if a complete set of drawings and specifications detailing such equipment as it pertains to this project are submitted for evaluation fourteen (14) days prior to the bidding. The submission should include a list of five (5) operating installations within a reasonable distance of the jobsite. List should include the names and telephone numbers of the operating personnel. The technical contents of the submittal shall include hydraulic calculations, equipment fabrication details, filter room layout in plan and elevation views specific to the project, warranties, installation and operating instructions.

5. Alternates meeting the terms and conditions of the bidding documents will be acknowledged prior to bidding by addendum. No alternates will be considered after the bid.
6. For any and all alternates approved in accordance with the above conditions, state the amount to be DEDUCTED from the BASE BID if an alternate filtration system is being offered.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to General Conditions, Division 01, and Section 13 1101.

#### **1.07 WARRANTIES**

- A. The "EQUIPMENT SUPPLIER" shall guarantee that the equipment to be furnished is of the correct capacity, that the various parts are designed to operate correctly and in conjunction with each other, that if the installation is made in accordance with the project drawings and operated in accordance with the suppliers instructions, the system will perform the prescribed functions correctly, the water entering the pool will be clear, bright, free from suspended matter visible to the unaided eye, and will be sanitary to the satisfaction of all authorities having jurisdiction.
- B. Defender filter tanks with Flexsol 3000 shall carry a 10-year limited fully rated warranty as regularly offered by the tank manufacturer.
- C. Bump tire shall carry a fully rated 1-year warranty.
- D. Valve bodies shall carry a 5-year fully rated warranty.
- E. Valve operators and system accessories including the RMF controller, quick exhaust valve and solenoid valve shall carry a 1-year warranty as provided by the product manufacturer.
- F. Unless otherwise specified, workmanship is to be guaranteed first class and carry a 1-year warranty.
- G. Internal filter tube elements shall carry a fully rated 10-year warranty.

### **PART 2 PRODUCTS**

#### **2.01 FILTER SYSTEM**

- A. The filter system under this section shall be as detailed on the drawings.
- B. It is the intent of these specifications to describe a filter system complete with all accessory items supplied and warranted by one manufacturer.
- C. The primary components of the system consist of the main filter tank, flex tube filter elements, element assembly, bump mechanism, vacuum transfer system, sight glass, pressure gauge panel, inspection (viewing) window, valves, automatic filter controller, air compressor.
- D. All components and related subassemblies shall be factory assembled and tested prior to shipment.

#### **2.02 FILTER TANKS**

- A. The filter tank(s) shall not be less than the diameter shown on the drawings, suitable for 50 psi working pressure and hydrostatically tested to 75 psi. Tank shell shall be not less than 1/4" thick. Bottom dished head shall be not less than 1/4" thick. Top flat head shall be not less than 1 1/4" thick. All material to be Type A-36, carbon steel.
- B. All welding shall be performed by qualified operators. Joints shall be butt or fillet welded inside and out by manual or automatic process. Welded joints shall have complete penetration and fusion with little or no reduction of the thickness of the base metal. Welds shall be free of coarse ripples, grooves, overlaps, abrupt ridges or valleys. All welded surfaces shall be chipped and brushed clean, when necessary, leaving no slag or splatter.
- C. Tank legs shall be type A-36 carbon steel. Bearing plates shall be type 304L stainless steel. Each bearing plate shall have (2) 5/8" drilled holes to secure to the floor with the 1/2" x 4 1/2" stainless steel concrete anchors provided. The legs shall be designed with bolted connections to minimize overall tank height for shipping and access into the mechanical room.

- D. The tank head shall be bolted to the shell with T304 stainless steel threaded rods and nuts, around the tank perimeter.
- E. Tank(s) shall be equipped with a UL listed grounding lug.
- F. Tank shall incorporate connections for filter influent, effluent, drain; vacuum transfer piping, viewing window, and lift shaft gland.
- G. Tank shall include brackets for mounting of automatic controller, gauge panel, filter / regulator, vacuum transfer blower and vacuum hose rack.
- H. Tank shall include an integrally mounted hydraulic lifting device (davit). The davit assembly shall be designed to lift the filter head and include a pivot mechanism allowing the head to rotate 180°, for access to the tube sheet. (Model SP-18-48-176 excludes davit requirement.)
- I. Tanks larger than 18" diameter shall include an integrally mounted hydraulic lifting device (davit). The davit assembly shall be designed to fit the filter head and include a pivot mechanism allowing the head to rotate 180°, for access to the tube sheet. Systems requiring additional devices for filter head removal will not be considered.

### **2.03 INTERIOR LINING**

- A. All interior surfaces shall be grit blasted to white metal condition with a 2-3 mil profile. Blasted surfaces shall be cleaned of all dust or blast residue. Lining shall be applied as soon as is practical on the same day blasting is done.
- B. Flexsol 3000® shall be a urethane, 100% solid plural component lining. Hardness shall be 75 durometer on the shore D scale. Break tensile strength shall be 4000 psi with elongation of less than 10%. Adhesion shall be greater than 2500 psi.
- C. Application of Flexsol 3000® lining shall be done by experienced applicators using a high pressure, high temperature plural component system. All wetted surfaces including flange faces, manway rings and manway covers shall be lined to 100 mils +/- 10 mils DFT.
- D. Hardness shall be verified after curing to ASTM D 2240 standard.
- E. Flexsol 3000® lining shall meet the NSF toxicity standard unconditionally and shall be approved for use with the NSF approved filter.
- F. Flexsol 3000® lined vessels shall carry a ten (10) year limited non-prorated warranty.
- G. The filter manufacturer shall bear the responsibility for suitability of lining and shall be the sole source for the specified warranty.

### **2.04 EXTERIOR COATINGS**

- A. All exterior surfaces shall be grit blasted to white metal condition with a 2-3 mil profile. Blasted surfaces shall be cleaned of all dust or blast residue and primed as soon as is practical on the same day blasting is done.
- B. When priming has dried the coating process will begin. If prime has sat for over twenty-four hours, a refresher coat will be applied.
- C. Two coats of high solids enamel shall be applied for a total developed film thickness of 5-8 mils.
- D. Manufacturer is to supply min. 16 oz of high solids enamel touch-up paint.

### **2.05 INTERNAL COMPONENTS**

- A. The filter shall consist of flex tube elements, filter tube sheet, stainless steel lift shaft and internal flow diversion assembly.
- B. The filter elements shall be flexible tubes that provide the support structure for the media. The outer wall of each element shall be fabricated of multi-filament high strength polyester braid. Each element shall have an internal T304 (optional T316) stainless steel spring, which acts a support structure for the braided filament.

- C. The filter element tube sheet shall be fabricated of T304 (optional T316) stainless steel and provide both support for the top of the element assembly as well as water tight seal to prevent media from escaping the filter tank.
- D. The lift shaft shall be fabricated from T304 (optional T316) stainless steel and provide the internal connection between the filter element tube sheet and the external bump mechanism.
- E. The filter influent connection shall be fitted with a T304 (optional T316) stainless steel flow diversion assembly to eliminate disturbance to the filter elements during operation.
- F. All stainless steel wetted fasteners shall be Type 304 (optional T316).

## **2.06 BUMP MECHANISM**

- A. The bump mechanism shall include a pneumatically operated tire mounted externally on the filter tank head. The tire is alternately pressurized then depressurized causing the connected filter element assembly to move in an upward then downward fashion. This movement shall provide the means of dislodging the media and accumulated solids, which then recoat the filter element. NOTE: Systems that do not incorporate a pneumatic bump mechanism shall not be considered.

## **2.07 VACUUM TRANSFER SYSTEM**

- A. The vacuum transfer system shall be provided to allow the recharging of media into the filter for either bag or bulk media.
- B. The vacuum shall include a 5 peak HP 115V single phase motor 60 Hz, cULus listed.
- C. A GFI protected receptacle shall be provided for field installation on the vacuum mounting bracket and field wired to the RMF controller.
- D. Provide three (3) 1-1/2" SCH 80 PVC ball valves: for the vacuum drain line, the blower inlet and the vacuum hose.
- E. The Manufacturer shall provide all necessary pipe, fittings and hardware for field plumbing of the vacuum transfer system.
- F. Provide a minimum 5 feet of vacuum hose with required fittings.

## **2.08 AUTOMATIC CONTROLLER**

- A. The automatic controller shall provide total control of the system's filtration and regeneration cycles, and provide all necessary equipment interlocks and timing mechanisms to execute the filter program.
- B. The controller shall include an adjustable pressure switch, factory set to 50 psi. The switch shall stop the filtration pump and close the pneumatic valves if air pressure falls to 50 psi.
- C. The controller shall control the operation of the following functions:
  - 1. Bump cycle-manual or automatic; with or without security interlock for data logging
  - 2. Pre-coating of the filter elements
  - 3. Stopping and starting of the man recirculation pump
  - 4. Opening and closing of pneumatically operated valves
  - 5. Vacuum transfer system
  - 6. Heater cool down delay
  - 7. Auxiliary contacts to interlock UV Lamps, chemical control, or other equipment
  - 8. 7-inch Hi-Res LCD Screen with Tactile Feedback Membrane
  - 9. Step-by- Step animated graphics
  - 10. Last Bump TM and Bump-n-Go TM Features
  - 11. Remote Operation via browser or phone
  - 12. Off Site Real-Time Status
  - 13. Email on change of condition
  - 14. Data logging of process
  - 15. Differential Pressure Monitoring and Bump Control
  - 16. Automatic maintenance reminders

17. Exporting of process data logs to .csv Excel TM Files
  18. Modbus Communications for PLC connectivity
  19. Nema 4x/IP66 approved/UL Listed
  20. Electrical Requirements: 120VAC-10-60Hz, 15-amp Circuit Protection (CP)/240VAC-10-50Hz, 10-amp CP
- D. The controller panel shall display the following functions:
1. Filter status
  2. Pre-coat status
  3. Filtration pump status
  4. Vacuum transfer pump status
  5. System power
  6. Last Bump
  7. Low Pressure Alarm
  8. Recirculation Pump off Alarm
  9. Pressure Differential
- E. The controller enclosure shall be NEMA 4X/IP66 Approved/4L Listed.
- F. The RMF automatic controller will provide signal power to the main filtration pump motor starter. The unit is required to be a device or variable frequency drive (VFD) and is to be installed with control wiring by the electrical contractor.
- G. The RMF shall be 120 V, 1 phase, 15-amp rated, and shall be UL labeled.
- H. NOTE: Systems without programmable, automatic bump/regeneration/filter modes shall not be considered.

## **2.09 FILTER REGULATOR**

- A. Each filter shall include a combination filter / regulator. The regulator shall be adjustable from 0 – 120 p.s.i. 1/2" F.P.T. connections shall be provided for field installation of air lines.

## **2.10 WATER SEPARATOR**

- A. One water separator with automatic drain shall be included for each air compressor supplied. 1/2" F.P.T. connections shall be provided for field installation of air lines.

## **2.11 AIR COMPRESSOR**

- A. Provide (1) air compressor per mechanical room with the following minimum requirements: 20-gallon tank, 2 HP, 115V, 1 phase, 15 amp, 5.2 CFM @ 90 psi, air pressure gauge, pressure relief valve, belt guard, pressure switch, air filter, and tank drain.

## **2.12 PNEUMATIC ACTUATORS**

- A. Each filter shall include pneumatic actuators for (1) influent valve, (1) effluent valve and (1) pre-coat valve.
- B. The actuators shall be double acting with valve mounted drilling to ISO 5211.
- C. The actuators shall include (2) 1/4" FPT ports for open / close connections. Flow control valves with quick connect fittings shall be provided at each port to allow speed control adjustment for the open / close function of the actuators.
- D. Materials of Construction
1. Body: aluminum alloy, extruded acc. to ASTM 6063, anodized acc. To UNI 4522
  2. Ends: Die-cast in aluminum alloy acc. To ASTM B179, epoxy-polyester coated
  3. Pistons: Die-cast in aluminum alloy acc. To ASTM B179
  4. Pinion: Nickel-plated steel
  5. Slideways: Acetal resin (LAT LUB 731320T)
  6. Fasteners: AISI 304 Stainless steel
  7. Springs: Epoxy coated steel, pre-compressed
  8. Seals: NBR Nitrile rubber

- 9. Lubricant: MoS2
- E. The actuators shall be factory lubricated to allow for 1,000,000 maneuvers.
- F. The actuators shall have adjustable travel stops for both directions.
- G. Working temperature limits: 4°F to 186°F. NOTE: Systems utilizing manually operated valves shall not be considered.

### **2.13 SOLENOID VALVES**

- A. Each filter shall include three (3) single solenoid 4-way valves mounted on a multi-station manifold for operation of the pneumatic actuators and bump mechanism.
- B. The solenoids valves shall include lighted DIN connectors.
- C. The solenoid valves shall be factory lubricated and shall not require any field lubrication.
- D. The solenoid valves with multi-station manifold shall be located on the bottom of the automatic controller, factory wired and include quick connect fittings for attachment to the pneumatic actuators and bump mechanism.
- E. The solenoid valves shall be SMC Series SY 7000, or equal.

### **2.14 VALVES**

- A. All valves 3" – 12" shall be constructed with cast aluminum ASTM S12A housing and fully coated with Rilsan on all interior and exterior surfaces. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and T304 stainless steel shaft. Valves 14" and larger shall be constructed with cast iron housing fully coated with nylon and with nylon coated ductile iron disc.
- B. Valves shall be butterfly valves and shall be provided for the effluent and pre-coat lines.

### **2.15 CHECK VALVES**

- A. Shall have epoxy coated body.

### **2.16 SYSTEM VALVES**

- A. Each defender filter shall include Five (5) system valves to facilitate system fill after media recharge, pre-coat/regeneration, influent & effluent for filtering and media dump/drain valve.
- B. The pre-coat/regeneration and effluent valves shall be butterfly type with pneumatic actuators per 2.12 & 2.14A.
- C. The system fill valve shall be butterfly type with gear operator and shall be the same size as the pre-coat/regeneration valve.
- D. The influent valve shall be wafer type check valve, ductile iron body w/double disc, SS type 304.
- E. The dump/rinse valve shall be butterfly type, lever operated with stainless steel type 304 extension to facilitate operation.
- F. Automated Dilution Valve shall be supplied and programmed by the RMF Controller to purge water from the system automatically to reduce pool water TDS levels.
- G. Automated purge valve shall be supplied and programmed by the RMF Controller to purge water from the filter drain on a regular timed basis.

### **2.17 MEDIA**

- A. Media shall be expanded perlite with a median particle size of 37 microns. Percentage retained on a +150 Tyler Mesh shall not be less than 8% or more than 25%. Darcy permeability shall be between 1.2-1.85.
- B. The media shall contain no more than 1 tenth of one percent (.001) of crystalline silicate.
- C. The media shall be certified by the Manufacturer for use in the filter. The media shall be NSF listed in and Std. 50.
- D. The media shall be as approved by filter manufacturer. The media shall be Aquaperl/Harborlite.

- E. Provide tank loaded with the manufacturer's recommended media. In addition to the initial installation of media to each filter, **provide seven (6) additional refills of media for each pool filter system** to the Owner. The project requires 254 lbs total for the 3 filters. **Contractor shall provide 1,778 lbs of media** after the the initial media installation used for training.

## 2.18 FILTER ELEMENT CLEANING AGENT

- A. The flexible filter elements should be cleaned (degreased/descaled) annually and possibly more often depending on water quality, bather load and exposure to oils and other contaminants. The filtration system shall never be operated in the recirculation mode without a proper media coating of the filter elements. The contractor shall provide the Owner a system with clean filter elements. If the Engineer or Filter Manufacturer determines that the elements require cleaning prior to project completion, the contractor shall clean the elements in accordance with the filter manufacturer's recommendations and instructions.
- B. The filter manufacturer shall include in the Filter O&M Manual, and in the System Operator Training, all information required for filter element cleaning, including but not necessarily limited to the following: recommended cleaning frequency, cleaning instructions, and recommended cleaning agent.
- C. The contractor shall provide to the Owner a supply of filter element degreaser/descaler cleaning agent with a copy of the material safety data sheet (MSDS). Quantity shall be 110% of the filter manufacturer's suggested quantity required to clean all filters one time. Include a copy of the MSDS sheet.
- D. Filter element degreaser/descaler cleaning agent product:
  - 1. "Filter Cleanse" by Great Lakes Bio Chemical Co., Inc., or as recommended by the filter manufacturer.
  - 2. Provide one-year supply of cleaning agent necessary to clean internal tube elements.

## PART 3 EXECUTION

### 3.01 FILTER SYSTEM

- A. Provide installation complete with factory representative training and equipment start.
- B. Pool Contractor shall deliver four complete sets of operating and maintenance instructions for operation, maintenance and cleaning of Filter system.
- C. Training and Start-Up
  - 1. Filter installation shall include a filter system "start-up" and "system operator training (SOT)". Start-up shall include the first-time use of the filter in recirculation mode and all system adjustments as needed for proper operation of all filter modes. SOT shall include written and verbal instructions and demonstrations required for the system operator to properly operate and maintain the filter system in all filter operating modes.
  - 2. Start-Up and SOT shall be completed by a fully trained and authorized filter manufacturer representative.
  - 3. Prior to initiating the Start-Up procedures, the contractor shall complete all equipment installation and tests as required for proper filter operations. Contractor shall obtain the "Pre-Start-Up" requirements/checklist directly from the filter manufacturer.
  - 4. Contractor shall coordinate and schedule the system start-up and training directly with the filter manufacturer and Owner.
  - 5. SOT session shall be a minimum of one (1) day duration. Obtain written documentation with a dated signature from the system operator that training was provided to their satisfaction.

## END SECTION

**131135**  
**POOL ULTRAVIOLET DISINFECTION EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pool Ultraviolet Disinfection Equipment

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 REFERENCES**

- A. The following latest edition reference specifications, guides and standards shall become part of this Specification as if herein written. If provisions conflict, the more stringent provisions shall apply.
  1. NSF – National Sanitary Foundation
  2. MET – Met Laboratories, Inc.
  3. CSA – Canadian Standards Association
  4. UL – Underwriters Laboratory
  5. NEMA – National Electrical Manufacturers' Association
  6. ANSI – American National Standards Institute
  7. USEPA UVDGM- U.S. Environmental Protection Agency Ultraviolet Guidance Manual
  8. Din- German Institute of Standardization
  9. IP- International Electrotechnical Commission

**1.04 SUBMITTALS**

- A. Drawings and Instructions
  1. Provide detailed Shop Drawings of the items of equipment being provided, indicating the dimensions, material and characteristics.
  2. Provide a detailed Operations Manual, embracing the operation functions and recurring maintenance processes.

**1.05 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

**1.06 QUALITY ASSURANCE**

- A. All SYSTEM components shall be supplied to the CONTRACTOR by a single EQUIPMENT SUPPLIER.
- B. The EQUIPMENT SUPPLIER shall have at least twenty (20) year experience providing medium pressure UV systems to the Aquatics market.
- C. The EQUIPMENT SUPPLIER shall design, develop, manufacture and test the SYSTEM in a facility that is assessed and registered as conforming to the requirements of ISO 9001:2008 quality management system.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to General Requirements and Division 01.

**1.08 WARRANTY**

- A. A factory trained representative of the manufacturer shall perform all warranty work. Manufacturer to warranty Ultraviolet chamber and Spectra Control panel for a period of 5 years (see requirements) excluding lamps, quartz and seals. Medium pressure Ultraviolet bulbs shall be warranted for a period of 8,000 hours. Intermittently operated lamps (□ 1 on/off cycle per day) will be replaced free of charge should failure occur prior to 4,000 hours and replacement will be prorated between 4,000 and 8,000 hours.



- B. Manufacturer must maintain spare or replacement parts in the USA for same day or no longer than next day delivery in North America, other areas based on expedited delivery available.
- C. A Service Agreement (twice per year maintenance) from a qualified factory certified distributor shall be provided to initiate the service to maintain the five-year warranty.

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. The UV System shall have a MET or equivalent (ETL, CSA, or UL) listing, be NSF-50 (2016 or later) certified including Section 14.18 (crypto inactivation), and 3rd party validated to the USEPA UVDGM 2006 Guidelines.
- B. Equipment General Description: The Ultraviolet System shall be provided in a complete package to include:
  - 1. Stainless steel chamber,
  - 2. Spectra Control System located in a NEMA 12 (IP52) rated panel,
  - 3. Medium pressure bulb(s) designed to emit wavelengths within the UVC electromagnetic spectrum,
  - 4. UV EZ Clean strainer,
  - 5. Automatic wiper system, and
  - 6. Project Commissioning by an Ultraviolet Technician certified by the manufacturer.
- C. Manufacturer: Ultraviolet Lamp/Chamber and Spectra Control Panel by Neptune Benson / Evoqua Water Technologies Ltd., or Architect/Engineer approved equal. Any deviation/exception must be provided in writing to and approved by the designer prior to the bid date.

### **2.02 UNIT TYPE**

- A. Wafer (WF) UV Units: Ultraviolet manufacturer to offer unit capability of a horizontal or vertical installation application using state of art design and direct flow through characteristics. Direct flow will be required in order to reduce total head loss through the system. Unit shall be medium pressure system with a flow rating as scheduled in the drawings, or greater, @ a maximum of 94% UV Transmission (UVT). Chamber and Control Cabinet shall be as indicated on the drawings.

### **2.03 ULTRAVIOLET REACTOR/CHAMBER**

- A. The unit shall be constructed of 316L stainless steel, electropolished and passivated to prevent corrosion within the harsh pool environment. Pressure drop across the unit will be minimal.
- B. The Ultraviolet chamber shall come complete with the following equipment:
  - 1. Ultraviolet intensity monitor factory calibrated to provide intensity in mW/cm<sup>2</sup> (monitors providing percentage of lamp output are not acceptable).
  - 2. Built-in alarm system to notify operator when output level drops below operator set dosing levels or the required level of 60 mj/cm<sup>2</sup> for indoor pools and 40mj/cm<sup>2</sup> for outdoor pools.
- C. Ultraviolet temperature control system shall be provided to maintain system integrity in the event of flow interruptions to the chamber.
- D. Ultraviolet chamber shall come complete with annealed quartz sleeve with "O" ring seals for water tightness. System shall be complete with advanced seal arrangement to reduce risk of quartz over compression on the seal face.
- E. Chambers shall be complete with ANSI 150 or DN flanges (as specified) and all ports or vents shall be threaded NPT. The Ultraviolet chamber must be capable of installation in the system so that it remains full under all conditions.
- F. Ultraviolet Reactor (Chamber) will be a validated system with third party testing to a recognized international standard such as the USEPA DGM.
- G. The ultraviolet unit must be complete with integrated brackets or feet for ease of installation in either vertical or horizontal mounting.

- H. The Chamber shall have a sacrificial anode attached to the chamber, extending inside the chamber and be bonded to the installation bond loop.

#### **2.04 ULTRAVIOLET LAMP**

- A. Ultraviolet lamp shall be medium pressure high intensity. Each lamp shall be designed to emit continuous ultraviolet wavelengths in the range of 200nm to 400nm. This will provide optimal disinfection/inactivation of bacteria, algae, molds and viruses and destruction of the Monochloramine, Dichloramine, and Trichloramine compounds. The lamp(s) must remain unaffected by temperature variance of 0 degrees F (-17C) to 200 degrees Fahrenheit (93 degrees Celsius).
- B. The lamp system must provide a constant calculated dose of not less than 60 mj/cm<sup>2</sup> until the end of the lamp life for indoor applications and not less than 40 mj/cm<sup>2</sup> for outdoor disinfection and this must be based on constantly treating the full recirculating flow rate, not on a side stream treatment. The system must be equipped with infinity variable power control of the lamp intensity & dose. Power stepping is not an acceptable alternative. The lamps shall be capable of turndown to 30% of the nominal rated power.
- C. The lamp shall be connected via means of a plug connector and shall have a mechanical interlock to prevent lamp removal when lit for safety reasons.

#### **2.05 AUTOMATIC WIPER SYSTEM**

- A. An automatic cleaning system shall be provided for cleaning of quartz sleeve and Ultraviolet monitor probe. The system shall travel the entire length of the quartz sleeve twice per desired cleaning cycle. Precision molded wiper rings shall be provided to ensure thorough quartz tube cleaning and quartz tube protection.
- B. Wiper cycle shall be user selectable and adjustable within a range of 5 minutes to 24 hours depending on anticipated application and deposit build-up.
- C. Automatic Wiper system shall have the following characteristics:
  - 1. System shall utilize direct drive with square faced coupling and acme threaded shaft to prevent slippage and pin shearing. Systems utilizing shear pins or complicated gear boxes will be unacceptable.
  - 2. Wiper power supply shall be 24-volt DC for improved safety. Higher voltage not acceptable.
  - 3. System shall incorporate Direct Shaft Encoding for positional location. Systems relying on external limit switches or internally located magnets will be unacceptable.
  - 4. Wiper interval shall be operator selectable with optional override switch.
  - 5. Wiper faults are to be indicated on the control system display.
  - 6. Wiper System to utilize "Intelligent Operation" for automatic start-up commissioning.
    - a. Records wiper position at chamber ends. Position must be fixed and not dependent on a timed interval or component striking end of chamber.
    - b. Establish a travel run without setting limit adjustments to ensure system integrity and longevity.

#### **2.06 UV STRAINER**

- A. The UV system must be provided with a downstream strainer to protect against the remote possibility of lamp /quartz breakage traveling downstream.
- B. The UV strainer must be cleanable by manual action without removal from the piping system. If electrical or pneumatic automation of this valve is required, the valve control shall be integrated into each the filtration and UV control systems.

#### **2.07 ULTRAVIOLET CONTROL SYSTEM**

- A. Control cabinet shall be a SPECTRA control unit and or pre-approved equal.
- B. The cabinet shall be an epoxy coated NEMA 13 / IP54 rated cabinet. If mounted outdoors it must be a NEMA4X /IP56 rated cabinet with an integral A/C unit to protect the components from the environment.

- C. The power must be controllable to provide full power, half power and infinite variable power based on real time interface with changes in UVT, Flow Rate or Combined Chloramines. The power panel must house the electronic ballasts required to ignite the lamps.
- D. Three levels of operation shall be provided to meet the needs of the operator and pool environment:
  - 1. Simple Control (start, stop and reset),
  - 2. Full Parameter Display, and
  - 3. Customized Operator Configuration.
- E. Modes of operation shall be password protected to secure system critical setup functions.
- F. Control system shall have clearly identifiable start, stop, and reset icons (suitable for gloved operation) with Running and Fault LCD indicators.
- G. The screen shall display the following:
  - 1. Ultraviolet Calculated Dose, derived from flow and intensity inputs
  - 2. Ultraviolet Intensity in units of % and mw/cm<sup>2</sup>
  - 3. Lamp Current
  - 4. Flow Rate. System shall accept a signal from an optional flow meter with display in units of gallons per minute (GPM) and m<sup>3</sup>/hour
  - 5. Chamber Temperature in units of deg. F and deg. C
  - 6. Operation Hour Meter
  - 7. System shall include alarm functions with simple text message display to assist in fault finding. Fault Indicators to include:
    - a. Lamp fault,
    - b. Low Ultraviolet Alarm
    - c. Temperature Alarm
    - d. Ground Fault Trip
    - e. Wiper Fault.
- H. Control system shall have a minimum of the following system interface control:
  - 1. Remote Operation
  - 2. Process Interrupt Features (from valves, flow meters)
  - 3. Low UV Dose (configurable to shut down or alarm only)
  - 4. Flow Meter Input
  - 5. Auto-Restrike
  - 6. Half to Full Power Ultraviolet Setting, with 24-hour/7-day settable timer
  - 7. Variable Power/Dose Pacing Interface
- I. Control system shall have built in data-logging capabilities to record the following information:
  - 1. Ultraviolet Intensity Required
  - 2. Ultraviolet Intensity Measured
  - 3. Lamp Current
  - 4. Chamber Temperature
  - 5. Flow Rate (if flow meter is connected) )Time and Date Stamp of all alarms generated
- J. Control system must be capable of the following communications:
  - 1. Interface with a Chemical Controller that can measure Total or Combined Chloramines to maintain the proper UV dosage required during the life of the lamp.
  - 2. Interface with the Defender filtration controller.
  - 3. Operating through Ethernet or Wi Fi with a method of uploading data to a Web based portal.
  - 4. Interfacing with a SCADA system including Modbus.
- K. Electrical Requirements:
  - 1. See Drawings for scheduled units and electrical requirements. Confirm scheduled information with manufacturer prior to purchase.
  - 2. Units include the following power/voltage capability:

- a. 208/220/230/240-Volt, single-phase for the 3" to 8" diameter UV units, 50/60 Hz
- b. 380/400/415/440/480-Volt, three-phase for the 10" and 12" diameter units, 50/60 Hz power.

### **PART 3 EXECUTION**

#### **3.01 SYSTEM INSTALLATION, STARTUP & TRAINING**

- A. Install in accordance with contract documents and manufacturer's instructions.
- B. All UV electrical power supply and connections shall be performed by licensed electrician in conformance with all applicable Building/Electrical Code requirements.
- C. Commissioning
  1. Ultraviolet Chamber and Control Panel shall be commissioned by a qualified factory trained technician to institute the Warranty.
  2. Final electrical and control cabling shall be connected from the control cabinet to the Ultraviolet disinfection chamber during the commissioning process.
- D. TRAINING
  1. System operations and maintenance instructions shall be provided during a training session to the Owner's operations personnel. All training shall be conducted by a technician trained and certified by the UV manufacturer.
  2. Contractor shall obtain Owner signature and date upon completion of training and include copy in the project Operations & Maintenance Manual.

### **END SECTION**

**131137**  
**POOL CHEMICAL SYSTEMS AND CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Chemical Controller with the following sensors:
  - 1. pH Sensor
  - 2. ORP Sensor
  - 3. Temperature Sensor
  - 4. Flow Sensor
- B. Free Chlorine Sensor
- C. Total Chlorine Sensor
- D. TDS Sensor
- E. Surge Tank Level Sensor
- F. Liquid Chlorine (Sodium Hypochlorite) Feed Pumps
- G. Acid (Hydrochloric or Sulfuric) Feed Pumps
- H. Liquid Chlorine (Sodium Hypochlorite) Storage Tanks
- I. Acid (Hydrochloric or Sulfuric) Storage Tanks

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 QUALITY ASSURANCE**

- A. The controller shall carry the following product certifications:
  - 1. NSF Standard 50
  - 2. UL 61010-1

**1.04 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Submittals required: For each type of manufactured material and product indicated. Provide Submittals indicating equipment provided, dimensions, material specifications, wiring diagrams and all accessory components including sensors.

**1.05 SUBSTITUTIONS**

- A. Refer to General Conditions, Division 01.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to General Conditions, Division 01.

**1.07 WARRANTIES**

- A. Controller shall be covered by manufacturer's 5-year warranty.
- B. ORP and pH sensors shall be covered by manufacturer's 2-year warranty.
- C. Other sensors and flow cell components shall be covered by manufacturer's 1-year warranty.
- D. Chemical feed pumps shall be covered by manufacturer's 2-year warranty.
- E. A factory trained/authorized representative shall provide training to the owner. The control system shall be provided with on-site start-up, on-site operator training, and 1-year on-site warranty service performed by a representative trained and authorized by the controller manufacturer.

**PART 2 PRODUCTS**

**2.01 ALL PRODUCTS LISTED AS BASIS OF DESIGN ARE ACCEPTABLE, AS ARE APPROVED EQUIVALENTS BY PROJECT MANAGER.**

**2.02 CHEMICAL CONTROLLER**

- A. The water chemistry control system shall provide continuous monitoring and control of the water chemistry and related disinfection equipment.
  - 1. The controller shall continuously monitor and control pH. Chemical feed shall be configurable for manual, automatic, proportional, and on/off modes.
  - 2. The controller shall continuously monitor and control sanitizer based upon the ORP reading, the free chlorine sensor, or both. Chemical feed shall be configurable for either on/off or time-based proportional feed.
  - 3. The controller shall have a programmable superchlorination function, based upon ORP or ppm superchlorination setpoint, which is triggered manually.
  - 4. The controller shall have a programmable dechlorination function, based upon ORP or ppm dechlor setpoint, which is triggered either manually or by the completion of the superchlorination function.
  - 5. The controller shall compute the Langelier Saturation Index and the Ryznar Saturation Index based upon sensor data and/or manual entered by the operator.
  - 6. The controller shall continuously monitor, display, and datalog system flow, maintaining a total flow volume. A Low Flow Alarm shall be operator settable, which can be programmed to disable chemical feeds.
  - 7. The controller shall also have a Minimum Flow Rate setting to turn off heater whenever system flow is less than this programmed minimum level. The controller shall also manage the heater on/off status based on real-time water temperature reading.
  - 8. The controller shall monitor TDS (total dissolved solids). The controller shall provide selectable control of TDS through simultaneous draining of water prior to filtration and addition of fresh make-up water.
  - 9. The controller shall continuously monitor, display, and data log pool or surge tank level. The controller shall automatically control a water makeup relay to add makeup water to maintain pool level set point based on pool or surge tank level.
- B. The standard display shall be a backlit transfective LCD that will continuously display information related to the following:
  - 1. All installed sensor readings
  - 2. Set points, with current control status
  - 3. All active alarms, including time activated
- C. The flow sensor shall be used to prove flow to the chemical controller to prevent dosing of chemicals during a system low flow/no flow condition.
- D. The controller shall automatically abort a Manual or Scheduled Turndown upon declining water chemistry and return to the standard programmed circulation rate to maintain optimal water quality. Declining water chemistry is signaled by any of the alarm conditions.
- E. The controller shall signal all alarm conditions with the following indicators:
  - 1. A bright flashing LED on the front of the controller.
  - 2. Each active alarm listed on the LCD display along with time activated.
  - 3. Email and text alarm notifications.
- F. The controller inputs are as follows:
  - 1. The controller shall have inputs available for pH, ORP, Temperature, free chlorine, and flow sensors.
  - 2. The controller shall come with a minimum of (3) fully assignable digital inputs available for items other than those listed above.
- G. The controller outputs are as follows:
  - 1. The controller shall have integral line or dry contact 5A solid-state relay outputs capable of switching 3A under all normal operating conditions available for Acid or Co2 feed and sanitizer feed pumps.

2. The controller shall come with a minimum of (2) fully assignable integral line or dry contact 5A solid-state relay outputs capable of switching 3A under all normal operating conditions available for items other than those listed above.
  3. All relays must account for the effects of the temperature gradient inside the IP66 or NEMA 4X enclosure. Systems that utilize relays that are not de-rated must submit an engineering evaluation justifying the use of relays at their full, optimal-condition capacity. All solid-state relays shall have a provision for an electrical interlock with the circulation pump motor starter.
  4. The controller shall come with a minimum of (8) separately isolated 4-20mA output signals.
  5. The controller shall be capable of expanded capabilities with optional expansion package.
- H. Required controller safety features:
1. The controller shall have built-in limits to the amount of time any relay control output may be forced on (i.e. in "Manual On" mode).
  2. The controller shall have programmable high and low alarm settings for pH, ORP, PPM, temperature, low flow & no flow and chemical overfeed, TDS, surge tank levels. The controller shall have a programmable lockout of sanitizer feed upon pH high or low alarm.
  3. The controller shall activate a No Flow alarm when the dedicated sample stream flow switch indicates there is insufficient flow through the sample stream. This No Flow alarm shall lockout all chemical feed control operations.
  4. The controller shall have a dedicated Emergency Off button on the front panel of the system, which immediately halts all chemical feeds and control outputs when pressed. This feature shall require entry of a security access code.
- I. Required controller remote communication and access features:
1. The controller shall have the ability to allow field upgrades and updates and programming as needed. Controller must be capable of being accessed via remote communication.
  2. The controller shall have a means to preserve data logs during power outages, for input level recording and events. All input levels shall be recorded and maintained for 365 days on the controller, with a sample taken every minute. The controller shall record and maintain the events over the last 365 days recording all alarms, parameter changes, user logins, and operational cycles related to all control features.
  3. The controller shall also support the following types of connection to 3rd party applications such as EMS, BMS, BAC and SCADA systems:
    - a. 1) MODBUS TCP/IP
    - b. MS/TP (RS485)
    - c. TCP/IP (Ethernet) BACnet connection  
The connection shall support access to Inputs (current readings), System Information, Set Points, Alarm Points, Control Status and Alarms. Set Points and Alarm Points shall be modifiable from the 3rd party application via the selected interface.
  4. The controller shall come with an integral Wi-Fi module.
  5. The controller shall be Windows 10 compatible or include the necessary software and apps to allow for the real-time monitor/ of the following via personal computer, smartphone, or tablet device:
    - a. Auto-Polling – to allow automatic download of data logs.
    - b. Graphical Operator's Console – to display current readings, setpoints, alarm points and control status mode.
    - c. Data Logging
    - d. Email and text alarms notifications.
  6. The controller shall require security access codes.
- J. The controller shall be housed in an IP66 or NEMA 4X polycarbonate enclosure. All high-voltage wiring shall be performed in a separate IP66 OR NEMA 4X enclosure that precludes access to the controller electronics.

### 2.03 PH SENSOR

- A. The controller shall provide a measurement of pH by utilizing a sensor with the following characteristics:
1. 2 – 12 sensing range
  2. operating temperature range of 32-140 °F (0-60°C)
  3. operating pressure range of 0 - 60 psi (0 TO 4.1 bar)
- The controller shall continuously monitor, display and data log pH with minimum 0.1 resolution.

### 2.04 ORP SENSOR

- A. The controller shall provide a measurement of ORP by utilizing a sensor with the following characteristics:
1. 0 to 999 mV sensing range;
  2. operating temperature range of 32- 140° F (0-60°C)
  3. operating pressure range of 0- 60 psi (0 TO 4.1bar)
- The controller shall continuously monitor, display and data log ORP with minimum 6mV resolution.

### 2.05 TEMPERATURE SENSOR

- A. The controller shall provide a measurement of water temperature by utilizing a sensor with the following characteristics:
1. 32 – 212°F (0 – 100°C) sensing range
  2. Operating temperature range of 32 – 212°F (0 – 100°C)
  3. Operating pressure range of 0-145 psi (0-10 bar)
- The controller shall continuously monitor, display and data log temperature with 5/9 °C (1°F) resolution.

### 2.06 CIRCULATION FLOW SENSOR

- A. The controller shall provide a measurement of pool circulation flow rate and volume by utilizing a flow sensor with the following characteristics:
1. Paddle wheel flow sensor
  2. O-ring seal
- The controller shall continuously monitor, display and data log flow rate with 0.45 lpm (0.1 gpm) resolution.

### 2.07 FREE CHLORINE SENSOR

- A. The controller shall provide a measurement of free chlorine by utilizing an amperometric sensor with the following characteristics:
1. to 10.0 mg/l (ppm) measuring range
  2. 41° - 113°F (5 to 45° C) operating temperature range,
  3. Operating pressure range 0-14.5 psi (0-1 bar)
  4. replaceable membrane and electrolyte
- The controller shall continuously monitor, display and data log free chlorine with 0.1 mg/l resolution.

### 2.08 TOTAL CHLORINE SENSOR (WITH COMBINED CHLORINE READING)

- A. The controller shall provide measurement of total chlorine utilizing a sensor with the following characteristics:
1. to 10.0 mg/l (ppm) measuring range
  2. (41° - 113°F) 5°-45°C operating temperature range
  3. Operating pressure range 0-44 psi (0-3 bar)
  4. replaceable membrane and electrolyte
- The controller shall continuously monitor, display and data log total chlorine with 0.1 mg/l resolution. The controller shall also continuously monitor, display and data log combined chlorine (from the total chlorine and free chlorine sensors) with 0.1 mg/l resolution.



## 2.09 CONDUCTIVITY/TDS SENSOR

- A. The controller shall provide a measurement of conductivity/TDS by utilizing a sensor with the following characteristics:
1. 0 to 20,000 micromhos (0 to 10,000 ppm TDS) measuring range
  2. 32 – 212°F (0 – 100°C) operating temperature range
  3. Operating pressure range 0-100 psi (0 TO 6.9 bar)
  4. O-ring seals
- The controller shall continuously monitor, display and data log conductivity/TDS with 1 micromho/ppm resolution.

## 2.10 AUTO-FILL WATER LEVEL SENSOR

- A. The controller shall provide a measurement of the water level by utilizing a continuous level sensor with the following characteristics:
1. Field configurable sensor length,
  2. Installation options for wall mount and stand pipe glass configurations.
  3. 4 to 20 mA output
- The controller shall continuously monitor, display and data log the water level with 10 mm (0.4") resolution or better. The controller shall use the sensor to control a water makeup valve to maintain water level (Autofill) and/or control a main drain modulating valve.

## 2.11 LIQUID CHLORINE (SODIUM HYPOCHLORITE) FEED PUMPS

- A. All liquid chlorine feed pumps shall be of the size and meet the output requirements indicated on the construction documents, meet all state and local code requirements, and shall meet the following criteria:
1. Self-priming adjustable peristaltic pump.
  2. 32-125° F (0-52°C) operating temperature range
  3. Operating pressure range: 0-25 psi (0-1.7 Bar)).
  4. Required suction lift: 25' (7.6 M) at sea level.
  5. Motor: Variable Speed DC Motor.
  6. Tubing: Norprene®, Norprene Chemical®, or Santoprene® tubes.
  7. Chemical compatibility: All components of feed pump must be resistant to Sodium Hypochlorite at 16% Maximum Strength.

## 2.12 ACID (HYDROCHLORIC/SULFURIC) FEED PUMPS

- A. All acid feed pumps shall be of the size and meet the output requirements indicated on the construction documents, meet all state and local code requirements, and shall meet the following criteria:
1. Self-priming adjustable peristaltic pump
  2. 32-125° F (0-52°C) operating temperature range
  3. Operating pressure range: 0-25 psi (0-1.7 Bar)
  4. Required suction lift: 25' (7.6 M) at sea level
  5. Motor: Variable Speed.
  6. Tubing: Norprene®, Norprene Chemical®, or Santoprene® tubes. Feed pump shall provide a mechanism to detect chemical spills from worn-out tubing and provide alarm notification.
  7. Chemical compatibility: All components of feed pump must be resistant to Hydrochloric and Sulfuric Acid at 50% maximum strength.

## 2.13 LIQUID CHLORINE (SODIUM HYPOCHLORITE) STORAGE TANKS

- A. All liquid chlorine storage tanks shall be of the size indicated on the construction documents and shall be vertical flat bottom tanks with fume-tight manway covers. Tanks shall be dual wall type (unless specified on drawings to include a separate secondary containment system), recommended for sodium hypochlorite storage by the tank manufacturer, and shall meet the following criteria:

1. The LMDPE or HDLPE Resin, natural in color, 1.9 specific gravity, and 41.4 bar (600 psi), which meets ASTM D 1998.
2. XLPE Resins shall not be considered suitable for sodium hypochlorite storage.
3. The finished surface of the tank shall be free as commercially practicable from visual defect such as foreign inclusions, air bubbles, pine holes, craters, crazing, and cracking that will impair the serviceability of the tank.
4. The tank shall be marked with the identity of producer, date (month/year of manufacturer, capacity, and serial numbers.
5. All fittings and flange faces shall be protected from damage during handling by covering with suitable material. Pipe, tubing, fittings, and miscellaneous small parts shall be packaged separately and not placed inside tank as they may scratch interior surface.

#### **2.14 ACID (HYDROCHLORIC OR SULFURIC) STORAGE TANKS**

- A. All acid storage tanks shall be of the size indicated on the construction documents and shall vertical flat bottom tanks with fume-tight manway covers. Tanks shall be dual wall type (unless specified on drawings to include a separate secondary containment system), recommended for hydrochloric and sulfuric acid storage by the tank manufacturer, and shall meet the following criteria:
1. The LMDPE, HDPE, XLPE Resin, natural in color, 1.9 specific gravity, and 41.4 bar (600 psi, which meets ASTM D 1998.
  2. All plumbing to the tank shall be hose type flexible connections resistant to hydrochloric acid capable of accommodating 4% lateral and vertical expansion and contraction of tank.
  3. The finished surface of the tank shall be free as commercially practicable from visual defect such as foreign inclusions, air bubbles, pine holes, craters, crazing, and cracking that will impair the serviceability of the tank.
  4. The tank shall be marked with the identity of producer, date (month/year of manufacturer, capacity, and serial numbers.
  5. All fittings and flange faces shall be protected from damage during handling by covering with suitable material. Pipe, tubing, fittings, and miscellaneous small parts shall be packaged separately and not placed inside tank as they may scratch interior surface.

### **PART 3 EXECUTION**

#### **3.01 CHEMICAL CONTROLLER INSTALLATION**

- A. Installation of the system shall be per the manufacturer's specification and no exceptions shall be allowed. A factory trained/authorized representative shall provide training to the owner. The control system shall be provided with on-site start-up, on-site operator training, and 1-year on-site warranty service performed by a representative trained and authorized by the controller manufacturer.
- B. Provide coordination and instructional training of the chemical controller's remote use functions and alarms with Owner's designated staff and information technology personnel.
- C. Calibration of chemical controller shall be executed only after the monitored pool temperature has been established to within 4 degrees of the design temp, or as required by the manufacturer's installation instructions, if more stringent.

#### **3.02 CHEMICAL STORAGE INSTALLATION**

- A. Tank shall be hydrostatically tested at time of installation.

#### **3.03 MANUALS**

- A. Manufacturer shall supply an Installation, Operation and Maintenance Manual describing features, operating instructions, maintenance procedures and replacement parts.

### **END SECTION**

**131140**  
**POOL HEATING SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Gas-fired Commercial Pool Heating Package - Heater must be a High Efficiency condensing boiler system utilizing titanium heat exchangers as described in the plan documents. One boiler with two heat exchangers on skid mount system.

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 DESCRIPTION OF WORK**

- A. Heating system for swimming pool. Coordinate all venting, interlocking and control wiring for pool heaters with HVAC Contractor.

**1.04 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Submittals required:
  - 1. Heaters
  - 2. Thermometers
  - 3. Printed and bound operating, installation, and service manuals

**1.05 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Refer to General Requirements and Division 01.

**1.07 WARRANTIES**

- A. Standard Manufacturer's Warranty

**PART 2 PRODUCTS**

**2.01 POOL HEATERS**

- A. Provide gas fired heater boiler – heat exchanger for pools, as scheduled on Contract Drawings, complete with controls.
- B. Heaters must be A.S.M.E. Coded and labeled by manufacturer if they exceed the HLW-101 service limits; a heat input of 200,000 Btu/hr (60 kW) or a nominal water-containing capacity of 120 gal (450 L).
  - 1. Pool heating package must be a high efficiency condensing boiler system. Efficiency must meet or exceed 96%.
  - 2. Pool heating package must include:
    - a. Modulating Burner with up to 10;1 turndown
    - b. Direct-Spark Ignition
    - c. Low NOx Operation
    - d. Sealed Combustion
    - e. Low Gas Pressure Operation
    - f. Titanium Plate and Frame Heat Exchanger
    - g. Building Management System Integration (ModBus Communication via BACNET) – with 0-10 VDC Input Control for Modulation or Set Point, 0-10 VDC Output for Modulation Rate – **Pool Contractor (installing contractor) verify with BAS Contractor prior to ordering equipment.**
    - h. Multi-color Graphic LCD Display
    - i. Temperature and Pressure gauges

- j. Inlet & Outlet Temperature Sensors
  - k. Flow Switch
  - l. ASME Certified "H" stamped gasketless design 160 PSI Working Pressure
  - m. ASME Pressure Relief Valve
  - n. 10 Year Boiler Warranty, 5 Year Titanium Pool Heat Exchanger Warranty, 1 Year Parts Warranty
- C. Provide and install per State and Local Codes, including State Boiler Code required control and safety device packages.

## **2.02 THERMOMETERS**

- A. Thermometers shall have an adjustable angle and separable 304 stainless steel socket thermowell. The insertion length shall accommodate pipe size as required by the manufacturer.
- B. Thermometers shall be liquid filled with a 9" scale, glass window, and dual face to display both Fahrenheit and Celsius temperatures, manufactured by Weksler, Marsh, Winters or approved equal; or thermometers shall be solar powered with digital display, glass passivated thermistor and aluminum stem as manufactured by Wika or approved equal.

## **PART 3 EXECUTION**

### **3.01 POOL HEATERS**

- A. Install per manufacturer's installation instructions and recommendations, and in accordance with all applicable State and Local Codes.
- B. Furnish and install thermometers in inlet and outlet piping to heater and downstream in the blended water stream.
- C. Furnish and install a pressure relief valve for each heater and pipe to within 6" of floor.
- D. Furnish and install a flow switch per heater manufacturer's requirements.
- E. Factory authorized start-up required. Start-up form shall be included in the Operating and Maintenance Manuals and submitted separately to the Architect/Engineer.

## **END SECTION**

**131142**  
**PERIMETER OVERFLOW GUTTER GRATING**

**PART 1 GENERAL**

- A. A perimeter overflow gutter system consisting of a continuous grating covered overflow channel as shown in documents shall be installed. The gutter shall be level throughout.

**1.02 SECTION INCLUDES**

- A. Polymer / High Density Polyethylene (HDPE) Grating – including with Pre-fabricated Swimming Pool

**1.03 RELATED DOCUMENTS**

- A. Drawings and Contract Requirements, including General and Supplementary Conditions and Division 01 – General Requirements, apply to this Section.
- B. Division 13 11 Pool specifications apply to this section
- C. Division 13 11 18 Pool Concrete
- D. Division 13 11 17 Prefabricated Swimming Pool

**1.04 REFERENCES**

- A. The following latest edition reference specifications, guides and standards shall become part of this Specification as if herein written. If provisions conflict, the more stringent provisions shall apply.
  - 1. ANSI – American National Standards Institute
  - 2. ASTM – American Society of Testing Materials
  - 3. NSF – National Sanitation Foundation Standard 50
  - 4. MAHC – Model Aquatic Health Code

**1.05 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Submit Shop Drawings, clearly indicating make, model, type, and size of grating
- C. Submit 4" x 4" samples of each of MFG. standard colors

**1.06 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Refer to General Requirements and Division 01.

**1.08 WARRANTY**

- A. Manufacturer's Ten-Year Warranty, prorated after one year.
- B. Grating installation shall be completed in accordance with all manufacturer's requirements for warranty coverage.

**PART 2 PRODUCTS**

**2.01 GENERAL**

- A. Provide perimeter overflow gutter grating type as identified and detailed in the drawings.
- B. Perimeter overflow gutter grating shall be provided from a single manufacturer.
- C. Materials shall meet product requirements within these specifications.

**2.02 POLYMER / HDPE OVERFLOW GUTTER GRATING**

- A. The grating shall be machined from a marine grade polymer or High Density Polyethylene (HDPE) sheets using 1" thick, UV- stabilized material. Material must meet or exceed ASTM D696 for Coefficient of Linear Expansion of material.

- B. The top surface of the grating shall be raised, water-shedding, slip-resistant and shall meet ASTM D2047 slip resistance (wet) with a nominal value of 0.62.
- C. Grating design shall meet ASTM D790-10 or ANSI/AS3996 Class A for covers and grates with load exceeding 10kN (2,248lb).
- D. The grating shall include machined slots providing at least 37.5% open area per foot for unrestricted water flow. The openings shall not exceed 3/8" (9.5mm) and shall comply with IBC child finger/toe entrapment guidelines. Direction of slots may be parallel and/or perpendicular to the pool wall as indicated in drawings.
- E. Grating width shall allow the insertion of the touchpad holding brackets between the grating and the gutter lip.
- F. All inside and outside corners and custom radii sections under 3-feet inside diameter (short radius section) shall be custom fabricated and strengthened by the manufacturer.
- G. Fasteners shall be SS-316, provided by the manufacturer, and installed per manufacturer instructions and as shown on drawings.
- H. Colors selected by the Architect/Owner from manufacturer's standard colors.
- I. Acceptable manufacturers:
  - 1. Myrtha Pools

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. Inspect project conditions prior to installation. Concrete support ledge must meet the grating manufacturer's minimum width requirements. Concrete surface shall be clean and level to allow a level grating installation. Report conditions detrimental to grating installation in writing to Architect prior to initiating installation.
- B. Install grating per manufacturer's instructions. Include manufacturer's PVC grating accessories (PVC curb angle, supports, hand-holds, fasteners and other accessories) as required by project conditions and/or as detailed in drawings.
- C. Installation shall not allow water flow beneath the grating and into the gutter trench. Follow manufacturer's installation methods and use manufacturer's approved sealant as required between grating and pool wall surface on the front skimming edge to assure water uniformly skims over the top skimming edge.
- D. Provide templates for corners or other conditions for shop fabrication to the manufacturer, per manufacturer's requirements. Field fabrication of corners and short radius sections is not permitted.
- E. Gap width between individual grating sections shall not exceed the specified machined opening width or width between bars. Gap width between grating and other surfaces shall not exceed 5/16" (8mm).
- F. The skimming edge elevation at the face of the pool wall shall be within 1/8" +/- of the pool static water elevation and must provide continuous skimming around the entire pool perimeter.
- G. Install manufacturer's fasteners to anchor grating. Space fasteners as indicated in drawings. Locate fasteners more frequently if required by code or manufacturer requirements.
- H. Protect grating from damage and concrete splatter. Clean grating of all dirt, debris, concrete splatter, and staining per manufacturer's instructions. Replace grating that becomes permanently marked, damaged, or stained during the construction process.

#### **END SECTION**

**131145  
POOL RAIL GOODS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Rail Goods
  - 1. Hand rails
  - 2. Grab rails
  - 3. Ladders
  - 4. Stanchions
- B. Accessories
  - 1. Wedge Anchors
  - 2. Compression Anchors
  - 3. Escutcheons

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 REFERENCES**

**1.04 DESCRIPTION OF WORK**

- A. Fabrication and installation of hand rails, grab rails, ladders, wave pool ladders, therapy rails, stanchions and accessories required for installations.

**1.05 QUALITY ASSURANCE**

- A. Refer to General Requirements and Division 01 of the Specifications for additional requirements.

**1.06 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Submittals required:
  - 1. Hand Rails
  - 2. Grab Rails
  - 3. Ladders
  - 4. Stanchions
  - 5. Stanchion Sockets
  - 6. Anchors
  - 7. Escutcheon Plates
- C. Provide care and maintenance instructions, embracing the operation functions and maintenance processes involved in connection with the complete system, including routine maintenance and cleaning. Provide information regarding maintenance practices and products which may be detrimental to the products.
- D. Printed and bound operating, installation, and service manuals.

**1.07 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to General Requirements and Division 01.

**1.09 WARRANTIES**

- A. Pool Equipment
  - 1. Manufacturer's Standard Warranty

**PART 2 PRODUCTS**

## 2.01 GENERAL

- A. Provide the equipment scheduled, and any necessary fittings, anchors, and connectors as required and not provided by the manufacturer. The equipment shall be the manufacturer and model number listed or a pre-approved equal. Although unit quantities are shown, it is the installing contractor's responsibility to verify and provide actual quantities required.
- B. The following manufacturers have been pre-approved as capable of providing products meeting this specification. Note that custom material/size/finish may be required from some of the manufacturer's listed to meet these specifications.
  - 1. Spectrum Aquatic, 800-791-8056
  - 2. SR Smith LLC, 800-824-4387
  - 3. Paragon Aquatics, 888-KDI-SWIM

## 2.02 MATERIALS OF CONSTRUCTION

- A. Hand Rails, Grab Rails
  - 1. All rail products specified in this section shall be 316L stainless steel.
  - 2. All rail goods with a grip surface (handrails, grab rails) shall be 1.50" OD.
  - 3. Provide rail material with 0.120 wall thickness.
  - 4. The surface of the rails shall be polished to a minimum 500 grit mirror finish and passivated according to ASTM A967.
  - 5. Final coating of steel shall be per manufacturer's standard treatment procedure. All welds shall be finished, polished, and passivated to blend and match the rail finish.
- B. Ladders
  - 1. All rail products specified in this section shall be 316L stainless steel.
  - 2. All rail goods with a grip surface (ladders) shall be 1.50" OD.
  - 3. Provide rail material with 0.145" wall thickness.
  - 4. The surface of the rails shall be polished to a minimum 500 grit mirror finish and passivated according to ASTM A967.
  - 5. Final coating of steel shall be per manufacturer's standard treatment procedure. All welds shall be finished, polished, and passivated to blend and match the rail finish.
  - 6. Ladder frames shall be fabricated with smooth, wrinkle-free bends.
  - 7. All steps shall have raised non-skid rubber insert treads. The width of the steps is as follows:
    - a. Ladders 5"
  - 8. Ends of all steps shall be curved to fit the OD of the ladder frames.
  - 9. The bolts for attaching the ladder steps shall have smooth, rounded heads and the underside of the head shall be curved to fit the OD of the tubing.
  - 10. Cross-braces shall be notched and welded to the ladder frames.
  - 11. Joints shall be cleaned and blended to match the finish of the pipe.
  - 12. Ladder connections at lower ends shall be as shown on drawings.
  - 13. See details on drawing for additional information and dimensions.
- C. Stanchions (Backstroke and activity)
  - 1. All rail products specified in this section shall be 316L stainless steel.
  - 2. Shall be 1.90" OD, 0.145" wall thickness
  - 3. The surface of the stanchions shall be polished to a minimum 500 grit mirror finish and passivated according to ASTM A967.
  - 4. Final coating of steel shall be per manufacturer's standard treatment procedure.
  - 5. Stanchions shall be 8'-0" tall and provided with a 2" ring on the top surface and a 2" ring on sliding collar.
- D. Wedge Anchors
  - 1. Rail Anchors shall be corrosion resistant, sized to accept the rail dimensions specified and a minimum of 4" deep. For anchors greater than 4" deep, contractor shall verify adequate concrete thickness at the anchor points.



2. Stanchion Sockets shall be corrosion resistant, minimum 6" deep and designed to accept a 1.90" OD stanchion.
- E. Escutcheon Plates
  1. Provide escutcheon plates for each anchor location, sized to match rail diameter.
  2. Shall be rail manufacturer's round, stamped 316L Stainless Steel escutcheon.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Manufacturer's Installation Instructions
  1. All equipment of this section shall be installed in accordance with industry standards and comply with manufacturer's installation instructions/recommendation. The contractor shall notify the engineer in writing of any discrepancies between the contract documents and the manufacturer's instruction. This notification shall include a request for clarification prior to installation.
- B. Install equipment true and level.
- C. Equipment shall be installed secure, with no "play" or movement when shaken.
- D. Rails goods shall be clean, free of dirt and contamination, and polished prior to turnover to owner.
- E. Protect Equipment from damage during installation and up to substantial completion. Repair or replace damaged parts.

**END SECTION**

**131146  
POOL EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pool Equipment
  - 1. Pool fittings, deck, maintenance, and safety equipment.
- B. Pool Specialty Equipment
  - 1. Spray and play equipment manufactured for use in swimming pools and/or spray pads.
- C. Pool Competition Equipment
  - 1. Starting Platforms

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 REFERENCES**

- A. Specialty Equipment
  - 1. Equipment submitted shall be designed by manufacturer to meet all federal, state, and local requirements.
  - 2. Equipment manufacturer shall meet applicable requirements of Consumer Product Safety Commission, ASTM, UL, and other applicable standards.
  - 3. Comply with ASTM F2461-09, standard practice for manufacture, construction, operation, and maintenance of aquatic play equipment.
- B. Competition Equipment
  - 1. Equipment submitted shall be designed by manufacturer to meet all federal, state, and local requirements.
  - 2. Equipment manufacturer shall meet applicable requirements of the following sanctioning organizations:
    - a. World Aquatics
    - b. USA Swimming
    - c. NFSHSA

**1.04 DESCRIPTION OF WORK**

- A. Refer to General Requirements and Division 01 of the Specifications for additional requirements.

**1.05 QUALITY ASSURANCE**

- A. Refer to General Requirements and Division 01 of the Specifications for additional requirements.

**1.06 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Submittals required:
  - 1. Pool Fittings and Equipment
  - 2. Deck Equipment
  - 3. Safety Equipment
  - 4. Maintenance Equipment
  - 5. Pool Specialty & Competition Equipment
    - a. Provide detailed Shop Drawings of equipment being installed, including but not limited to:
      - 1) Location
      - 2) Flow rates
      - 3) Safety equipment

- C. Provide a typed sheet of Operating Instructions, embracing the operation functions and maintenance processes involved in connection with the complete system, including routine maintenance, and start-up.
- D. Printed and bound operating, installation, and service manuals.

#### **1.07 COORDINATION**

- A. Coordinate Competition equipment with other related suppliers and trades (Timing equipment, movable bulkheads, etc.).

#### **1.08 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

#### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to General Requirements and Division 01.

#### **1.10 WARRANTIES**

- A. Pool Equipment
  - 1. Manufacturer's Standard Warranty
- B. Pool Specialty Equipment
  - 1. Manufacturer's Standard Warranty – 2-year minimum

### **PART 2 PRODUCTS**

#### **2.01 GENERAL**

- A. Provide the equipment scheduled on the drawings, and any necessary fittings, anchors, and connectors as required and not provided by the manufacturer. The equipment shall be the manufacturer and model number listed or a pre-approved equal. Although unit quantities are shown for value engineering purpose, it is the installing contractor's responsibility to verify actual quantities required.

#### **2.02 STARTING PLATFORMS**

- A. Provide starting platforms as scheduled on the drawings, and any necessary fittings, anchors, and connectors as required.
  - 1. Frame Material:
    - a. 304L Stainless Steel
    - b. Fiberglass/FRP
  - 2. Frame Finish:
    - a. Polished
    - b. Powder Coated, color selection from Manufacturer's full range of standard colors.
    - c. Manufacturer's standard
  - 3. Top Material:
    - a. Manufacturer's standard non-slip top
    - b. Custom top
  - 4. Configuration:
    - a. Single / Double Post
    - b. Side / Rear step
  - 5. Accessories:
    - a. Side rails
    - b. Adjustable Foot Wedge
    - c. Integrated Timing Connections
  - 6. Customization:
    - a. Provide customized art / logos as indicated in drawings. Artwork requirements provided by Owner. Provide customization at following:
      - 1) Top
      - 2) Wedge
      - 3) Step

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Manufacturer's Installation Instructions
  - 1. All equipment of this section shall be installed in accordance with industry standards and comply with manufacturer's installation instructions/recommendation. The contractor shall notify the engineer in writing of any discrepancies between the contract documents and the manufacturer's instruction. This notification shall include a request for clarification prior to installation.
- B. Install equipment true and level.
- C. Protect Equipment from damage during installation and up to substantial completion. Repair or replace damaged parts.

**END SECTION**

**131147  
POOL PLAY EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pool Play Specialty Equipment
  - 1. Interactive spray and play equipment manufactured for use in swimming pools and/or spray pads.
  - 2. Climbable Aquatic Structures
  - 3. Above ground and flush mounted aquatic spray/play equipment.

**1.02 POOL ASSOCIATED BID ALTERNATES INCLUDE:**

- A. BID ALTERNATE #4 – AquaClimb Aqua ZipN – This feature is associated with Pool B. Provide cost for furnish and installation of complete Aquai ZipN including protective deck padding in location shown in plan drawings.
- B. BID ALTERNATE #5 – Reduced Flow - Play Structure – This feature is associated with Pool C. Bid Alternate #5 shall provide a cost for an alternative smaller Spray Structure equivalent to a Vortex 3 platform structure with a “dumping bucket style” feature with a maximum flow of 450 gpm for the entire structure. Design pump, VFD and piping for the base bid play structure shall remain the same size.

**1.03 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.
- B. For waterslides, see specification section 131165.

**1.04 REFERENCES**

- A. Pool Play Equipment shall
  - 1. Be designed by manufacturer to meet all federal, state, and local requirements.
  - 2. Meet applicable requirements of Consumer Product Safety Commission, ASTM, UL, and other applicable standards.
  - 3. Comply with ASTM F2461, Standard Practice for Manufacture, Construction, Operation, and Maintenance of Aquatic Play Equipment
  - 4. Comply with ASTM F1487 Standard Consumer Safety Performance Specification for Playground Equipment for Public Use
  - 5. Comply with 2010 ADA Standards for Accessible Design
  - 6. ASTM A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

**1.05 DESCRIPTION OF WORK**

- A. Refer to General Requirements and Division 01 of the Specifications for additional requirements.
- B. Delegated Design: The climbable aquatic play structure manufacturer is responsible for a project site-specific design of the structure elements as outlined herein. See ‘Delegated Design’ definition in Specifications Section 13 11 13 POOL GENERAL.

**1.06 QUALITY ASSURANCE**

- A. Refer to General Requirements and Division 01 of the Specifications for additional requirements.
- B. Manufacturer's Qualifications:
  - 1. Manufacturer shall have a minimum 10 years of experience in the design, engineering, manufacture, and fabrication of pool play equipment and components. The person(s) responsible for installation shall have supervised/installed a minimum of 5 (Five) installations of a similar nature and scope to the installation described herein.

2. Manufacturer shall provide independent and accredited certification that it applies a quality management system which meets the requirements of ISO 9001:2008 or ASTM F1193, manufacturing, sales, marketing and servicing of recreational aquatic products and accessories.
  3. The person(s) responsible for installation shall be on-site performing such service.
- C. Provide evidence of commitment of quality craftsmanship as demonstrated by the following:
1. Products shall be designed and produced at a facility owned and directly supervised by the supplier.
  2. A full-time licensed engineer must be on staff.
  3. A full-time quality control manager must be on staff.
  4. Established customer service department and a ready supply of replacement parts.

#### **1.07 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Shop drawings:
1. Promptly after award of the contract, the contractor shall submit complete shop drawings to include, but not be limited to:
    - a. Location and sizes of pipe connections and spray fittings
    - b. Equipment flowrates and pressure demands
    - c. Required Safety equipment (landing pads, stanchions, etc.)
    - d. Required conventional footings, thickened slabs, fasteners and/or anchors as engineered by the manufacturer.
    - e. Materials of construction
    - f. Color Renderings of Thematic Finishes and Structures
    - g. Structure Elevations above Finished Grade and Required Clearances
    - h. Area of pool or pad requiring flat concrete work
    - i. Details of connections to sloping concrete work
    - j. Comprehensive Color Selection Work Sheet and Color Samples
    - k. Recommended safety signage
  2. Submittals for above grade features shall be certified and sealed by a structural engineer, licensed in the project state.
- C. Provide a printed, bound hard copy of the operation, maintenance and service instructions for the complete system including the following: operational functions as designed, scheduled maintenance, maintenance processes, start-up procedures, and winterization requirements.

#### **1.08 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.
- B. Pool Play Equipment, other than the basis of design, must be pre-approved for equivalency by the Owner and Engineer prior to bidding. Vortex, Whitewater West Industries, Splashtacular, Waterplay, and Proslide, etc. shall be permitted manufacturers for equivalent substitutions.
- C. Climbable aquatic play structure walkable surfaces shall be plus or minus 10% of the surface area of the basis of design structure. Access to the structure and slide terminations off the structure shall be generally consistent with the basis of design. Total elevation and elevation of walking platforms shall be generally consistent with the basis of design.
- D. Substituted play structure shall be designed to accommodate the pool or spray pad floor slopes as designed. Structures requiring modification of the pool or spray pad shall not be acceptable.
- E. Above grade pool play equipment, including climbable aquatic structures, will be reviewed for thematic, aesthetic and play value equivalency.
1. Substituted climbable aquatic structures shall meet or exceed the total number of interactive play/spray elements, and provide equivalent ADA access and specialty equipment. Substitution requests shall include an accounting and description of the total

- number of interactive play elements accessible on the play structure from grade and total number of features meeting ADA guidelines.
2. Spray and play elements shall provide similar spray patterns and/or interactive play value to the basis of design product.
  3. Substituted play equipment shall provide a cohesive theme to match the basis of design and complement the facility.
  4. Because form, aesthetics and theme are subjective in nature, the Owner shall have the ultimate approval authority for equivalent above grade specialty equipment.
- F. Climbable Aquatic Play Structure Submittal:
1. Provide for review, a complete set of themed renderings and engineering shop drawings, photos of similar installations, hydraulic calculations, and specifications, prepared specifically for this project and submitted to the Engineer/Owner for review. Drawings shall include the located play structure with footings, pipe connections, safety zones and spray zones identified. Modifications required to pump system, electrical design, piping, surface drains and surge tank design for use of the substituted products must be specifically identified as part of the submittal package. The proposed pump model, electrical panel modifications, hydraulic calculations, pipe size, pipe penetration layout, drain size and sump design shall be provided as part of the submittal.
  2. All shop drawings shall be certified and sealed by a structural engineer, registered and licensed in the project state.

#### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to General Requirements and Division 01.
- B. Product Delivery, Storage and Handling
  1. Pool play equipment must be properly wrapped and secured in place while in transit to the project site. Care shall be observed during offloading and handling to prevent excessive stress and abrasions.
  2. Store pool play equipment in safe areas, out of the way of traffic and other construction activities, until the actual time of the installation. If required, provide safety barricades or other like precautions for the protection of public and adjacent property.
  3. Unless otherwise required by the manufacturer, maintain safety wrapping through installation.
  4. Loading and unloading equipment, as required, shall be coordinated and provided by Contractor.
  5. Identifying and resolving shipping damage issues shall be the responsibility of the Contractor.

#### **1.10 WARRANTIES**

- A. Provide the minimum warranties as follows:
  1. All materials, components, and coatings to be warranted to be free from defects in workmanship or materials and free from defects arising from process of manufacture for a period of 1 year.
  2. The warranty period shall start at the time of substantial completion.
  3. All warranties shall be managed by the equipment manufacturer.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL**

- A. Provide the equipment scheduled on the drawings, and any necessary fittings, anchors, and connectors as required and not provided by the manufacturer. The equipment shall be the manufacturer and design/model number listed on the drawings or a pre-approved substitution. Although unit quantities are shown, it is the installing contractor's responsibility to verify actual quantities required.
- B. Pool Play Equipment shall be suitable for installation in aquatic facilities and public play areas.

- C. Pool Play equipment shall be provided with Grounding / Bonding lugs compliant with NEC requirements.
- D. Safety and Craftsmanship
  1. All exposed edges of pool play equipment shall be machined to a rounded edge.
  2. All welds shall be grinded, polished, watertight, and factory pressure tested.
  3. Nozzles and Spray heads shall be recessed, flat or rounded to provide no protrusion hazard.
  4. All assembly and interactive pool play components shall be designed and built to ensure a completely safe play environment with no pinch, entrapment potential or protrusion hazard.
  5. All accessible posts and support posts shall have material covering the anchoring assembly and hardware.
  6. All products shall be designed in accordance with the latest ASTM and CPSC, for aquatic play equipment.
- E. Provide manufacturer's recommended safety signage and AHJ required signage, rated for outdoor use, except where noted otherwise.

## 2.02 CLIMBABLE AQUATIC STRUCTURES

- A. Climbable Aquatic Structures shall be designed to withstand its self-weight, imposed live load from patrons, climatic loads, and seismic effects as required by the latest ASTM F2461 and the relevant Structural Design Codes applicable at the project site location; whichever is more stringent.
- B. Aquatic Structures Materials:
  1. Structural Tubing: Factory powder coated, Type 304/304L stainless steel type, minimum schedule 10 thickness or hot dipped galvanized min schedule 40 per ASTM A123/A123M. Fiber reinforced polymer (FRP) and/or molded fiberglass, PVC, filament wound tubing, and aluminum shall not be utilized for any above or below grade structural components of the aquatic structures.
  2. Structural Decks: Perforated stainless steel with factory finished slip-resistant surface or self-supporting fiberglass with factory slip-resistant finish. Decks shall be structurally designed, capable of supporting a minimum load of 100 lb/ft<sup>2</sup>. Deck finish shall be UV and chemical resistant and suitable for public spaces.
  3. Stairs: Stairs shall have a minimum depth of 12", except where required by ADA to be 14" and a minimum width of 28 inches, unless otherwise indicated on the contract drawings. Stairs shall be compliant with ADA regulations for "transfer" systems, where required.
  4. Barrier Panels/Guardrails/Handrails: Barrier panels on elevated platforms and stairs shall provide a minimum 42" guardrail height with a continuous handrail at a height of 34 to 38" on stairs. Barrier panels shall be polycarbonate, fiber reinforced plastic, or hot-dipped galvanized steel with a factory applied finish treated for extended UV resistance. For Acrylic panels, minimum UV resistance / light transmission threshold shall be a minimum of 82% as per ASTM D1003. Grab rails shall be aluminum or an equivalent corrosion resistant material not requiring paint.
  5. Below Deck Barrier: Areas beneath the walking surface, less than 84" clear from the pool or spray pad finish, shall be protected with a non-climbable barrier. Means for controlled access to these areas shall be provided for maintenance activities and installation.
  6. Bridges: Bridges shall be non-corrosive, slip-resistant and designed with no pinch-points or entrapment potential. Bridges shall be provided with guard rails and handrails, as required in Barrier Panels/Handrail section of this spec. Bridges shall provide a minimum clearance of 7'-6" to spray pad surface, 5'-0" to water surface, and 8'-0" minimum to pool floor.
  7. Nozzles: Nozzles shall be non-corrosive, impervious to galling, precision machined, and shall use tamper resistant tools for installation and removal. Nozzles and spray heads shall be recessed, flat or rounded to provide no protrusion hazard and sized to prevent finger and toe entrapment.



8. Interactive Valves: All Butterfly valves shall be stainless steel with EPDM seat. Valve handles shall be non-climbable and located to prevent impact. All ball valves shall be PVC or stainless steel. All rope pull operated valves shall be self-closing with stainless steel or brass bodies and/or operating parts. Valves and piping shall be capable of withstanding a 79 kg (175 lb.) live load.
9. Finishes:
  - a. Steel Structure: Provide a factory applied finish that is UV, chemical resistant, damage resistant and suitable for public spaces.
    - 1) Powder coat paint finish coatings shall be heat-cured super-durable powder coating.
    - 2) Galvanized steel shall be hot-dipped galvanized, with catalyzed epoxy primer, painted with two coats of catalyzed polyurethane topcoat or an equivalent high performance Tnemec epoxy paint system.
  - b. Concrete Pedestals: Contractor shall install pool finish materials on all submerged and freeboard level concrete pedestals. Match pool wall finishes detailed in the Pool Drawings and Finish Schedule.
10. Flange Protection: On all accessible support posts and play product bases provide a covering for the anchoring assembly hardware to protect against pinch points and protrusions.
11. Integral Play Structure Manifold: Provide an integral pipe manifold contained beneath the play structure Below Deck Barrier. The main structural body shall be type 304/304L stainless steel pipe, PVC, structurally capable of withstanding anticipated forces, durable, and highly resistant to corrosive environments. Rigid fiber reinforced polymer (FRP) and/or molded fiberglass, filament wound tubing, Galvanized Steel, or Aluminum shall not be utilized for manifold main body.
12. Mounting and Assembly Hardware: All hardware and anchoring systems shall be high corrosion resistant marine grade type 304 or 316/316L stainless steel and utilize self-locking device (locking nuts, locking washers or thread locking compound) to avoid loosening and to deter vandalism and theft.
- C. The climbable aquatic structure shall contain the play components itemized on the drawings or equivalent features at a minimum.
- D. Climbable Aquatic Play Structure Slides:
  1. Poly Slides: Shall be constructed of rotationally molded U.V. stabilized linear Low Density Polyethylene (LDPE) and color as specified. Slide slope should be a maximum of 30 degrees from horizontal, shall meet the ASTM F2461 standard and shall include the slide landing mat and installation hardware.
  2. Fiberglass Waterslides: All waterslide flumes shall be constructed of marine grade fiberglass reinforced plastic with chemical and UV resistant gel coat. Structural members shall be factory painted, type 304/304L stainless steel or hot-dipped galvanized structural tubing.
    - a. Fiberglass Waterslides with runout: The run-out cross section shall be 10- 22" (305mm) in height to allow safe and easy exit for riders.
    - b. Fiberglass Waterslides terminating in pool: Slides from the play structure terminating in a pool without a runout shall meet all applicable requirements of Specifications 13 11 65 and ASTM-F2376-08 "Standard Practice for Classification, Design, Manufacture, Construction, and Operation of Water Slide Systems".

### **2.03 ABOVE GRADE POOL PLAY EQUIPMENT (OTHER THAN CLIMBABLE AQUATIC STRUCTURES)**

- A. Above grade pool play equipment shall be as shown and scheduled on the contract documents.
- B. Materials of Construction for Above Grade Specialty Equipment shall be:
  1. Safety: Non-climbable, aquatic play features shall meet ADA compliance for handicap accessibility and meet or exceed current ASTM playground safety standards. Equipment must be designed and manufactured to prevent finger entrapment.

2. Steel Components: Factory Powder Coated, Type 304/304L Stainless Steel or hot-dipped galvanized for structural tubing and components. All curved support posts shall be smooth with no joints or ripples.
  3. Fasteners: All fasteners and hardware shall be constructed of 304L/316L marine grade stainless steel. No unfinished plain steel hardware shall be allowed. Exposed and accessible hardware shall be tamper-resistant, requiring a special tool for removal.
  4. Finish: Provide a factory installed finish that is UV, chemical resistant, damage resistant and suitable for public spaces.
    - a. Powder coat paint finish coatings shall be heat-cured super-durable powder coating.
    - b. Galvanized steel shall be hot-dipped galvanized, with catalyzed epoxy primer, painted with two coats of catalyzed polyurethane topcoat or an equivalent high performance tmemec epoxy paint system.
  5. Spray Nozzles, Caps and Heads: Shall be manufactured from corrosion resistant solid Ultra-High Molecular Weight Polyethylene (UHMW) plastic, rigid UV treated polyurethane, Lead Free Brass or 304/304L Stainless Steel. Exposed hardware shall be tamper resistant. PVC, Nylon, and Delrin™ material shall not be utilized.
  6. Rotational Joints: This joint shall provide smooth operation, be free of any pinch points and contain no flexible hoses.
  7. Hoses: Flexible hose shall be constructed of high-grade PVC compound for flexibility with internal braided reinforcement. It shall be installed using stainless steel hose fittings and two (2) protective covers without sharp edges and pinch points. Hose shall be installed to prevent entanglement.
  8. Interactive Valves: All Butterfly valves shall be stainless steel with EPDM seat. Valve handles shall be non-climbable and located to prevent impact. All ball valves shall be PVC. All rope pull operated valves shall be self-closing with stainless steel or bras bodies and/or operating parts. Valves and piping shall be capable of withstanding a 79 kg (175 lb.) live load.
  9. Water guns/cannons: The water gun/cannon shall be mounted on a base that will allow the gun to be directed by the user. Water guns/Cannons shall have pivot controls, capable of limiting rotational range.
- C. Manifolds:
1. Mounting and Connections: Provide a water distribution manifold consisting of a main pipe divided in multiple water outputs and valves to permit water flow adjustment for each output line.
  2. Location: The Water Distribution Manifold shall be located as shown on the drawings

#### **2.04 FLUSH MOUNTED POOL PLAY EQUIPMENT**

- A. Flush mounted pool play equipment shall be as shown on the contract documents.
- B. Materials of Construction for Flush Mounted Equipment shall be:
1. Safety: Installed flush with adjacent surfaces, except where noted on contract documents. Pool play features are to meet or exceed current ASTM playground safety standards, ADA Standard for handicap accessibility and be designed and manufactured to prevent finger and toe entrapment.
  2. Nozzles: Provided with temper resistant brass, stainless-steel or equivalent material spray cap and winterizing cap.
  3. Maintenance: All outdoor pool play features of flush mount design shall provide winterization.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Product Installation
1. When applicable, templates shall be supplied to facilitate the installation of embedded anchoring equipment.

2. All posts shall have electrical grounding studs incorporated into their associated anchoring equipment. All play products shall be grounded by the installer per local codes.
  3. Drawings and Instructions: Product drawings and installation manuals shall be supplied by the manufacturer for ease of installation.
- B. Concrete Pedestal Finishes:
1. Contractor shall install pool finish materials on all submerged and freeboard level concrete pedestals. Match pool wall finishes detailed in the Pool Drawings and Finish Schedule.
- C. Manufacturer's Installation Instructions
1. All equipment of this section shall be installed in accordance with industry standards and comply with manufacturer's installation instructions/recommendation. The contractor shall notify the engineer in writing of any discrepancies between the contract documents and the manufacturer's instruction. This notification shall include a request for clarification prior to installation.
- D. Install equipment true and level, with flush fitment to surfacing material.
- E. Protect Equipment from damage during installation and up to substantial completion. Repair or replace damaged parts.
- F. Touch up:
1. Touch up finish paint (if applicable) and touch up paint for cold galvanizing shall be provided by the manufacturer.
  2. All repairs to galvanized surfaces shall be carried out in accordance with ASTM A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- G. Start up:
1. Follow manufacturer's instructions for start-up.
  2. Prior to start-up Contractor shall confirm all piping is free of debris that can clog nozzles.
  3. Contractor shall adjust the overall flow and/or distribution to the pool play equipment for balanced aesthetic and safe play.
  4. Contractor shall verify proper operation of all interactive components.
  5. Upon completion of construction, the contractor shall provide the owner /operator adequate training on the pool play equipment uses, operations and maintenance.

**END SECTION**

**131148**  
**POOL COVERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Swimming Pool Insulated Covers
- B. Swimming Pool Cover Reels

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 REFERENCES**

- A. The following latest edition reference specifications, guides and standards shall become part of this Section as if herein written. If provisions conflict, the more stringent provisions shall apply.
  - 1. ASTM F1346-91 – Standard Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools
  - 2. ASTM D1910 – Methods of Test for Construction Characteristics of Woven Fabrics
  - 3. ASTM D751 – Standard Test Methods for Coated Fabrics
  - 4. ASTM G154 – Standard Test Methods for Sunlight and Moisture Exposure
  - 5. ASTM D2336 – Standard Method of Test for Thermal Conductivity of Cellular Plastics by means of a probe
  - 6. ASTM A967 – Standard Specification for Chemical Passivation Treatment for Stainless Steel Parts
  - 7. ASTM F1346 – Standard Performance Specification for Safety Covers and Labeling Requirements for all Covers for Swimming Pools, Spas and Hot Tubs
  - 8. ASTM A554 – Standard Specification for Welded Stainless-Steel Mechanical Tubing

**1.04 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Submit product data and manufacturers sales literature for each product indicated.
- C. Submit shop drawings for approval before ordering covers. Include the following:
  - 1. Plan, interior elevations, and sections of building locating wall mounted covers.
  - 2. Plan indicating covers layouts, cover sections, anchor locations
- D. Maintenance data: Include installation, operation and maintenance manuals. Provide common stain removal methods.
- E. Samples:
  - 1. Cover material including:
    - a. Reinforced end edge
    - b. Weighted side edge
    - c. Seam (if project required)
    - d. Grommet
    - e. 8" x 12" minimum size
  - 2. Tubing used for winding tube
- F. If submitting hard copy submittals, provide a minimum five copies.

**1.05 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Refer to General Requirements and Division 01.
- B. Deliver all products to job in manufacturer's unopened containers with seals unbroken and labels intact.

### 1.07 QUALITY ASSURANCE

- A. Single source responsibility:
  - 1. Obtain covers, storage reels and other cover equipment from single source.
- B. Manufacturer Qualifications:
  - 1. Covers: Minimum five (5) years' experience in manufacture of cover products.
  - 2. Reels: Minimum ten (10) years' experience in manufacture of the type of reel specified.

### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's unopened containers, fully identified with brand, name, type and grade.
- B. Store materials on elevated platforms, under cover, and in a dry location. Protect materials from contamination, dampness, freezing or overheating in accordance with manufacturer's instructions.

### 1.09 ENVIRONMENTAL REQUIREMENTS

- A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
- B. Do not begin installation until construction in spaces is complete and ambient temperature and humidity conditions are consistent with standards and manufacturers written instructions.

### 1.10 WARRANTIES

- A. Contractor shall provide written materials and installation warranty, executed by the contractor, Installer and Manufacturer, agreeing to repair or replace cover and/ or equipment that fails in material or workmanship within the specified warranty period.
  - 1. Warranty Period:
    - a. Ten (10) years after Substantial Completion, or manufacturer's system warranty, if longer for manual storage reels.
    - b. Five (5) years after Substantial Completion, or manufacturer's system warranty, if longer for cover materials, seams, and grommets.
    - c. Two (2) years after Substantial Completion, or manufacturer's system warranty, if longer for automatic reels, storage reels control components.
    - d. One (1) year after Substantial Completion, or manufacturer's system warranty, if longer for cover straps & buckles, and pumps.

## PART 2 MATERIALS

### 2.01 GENERAL

- A. Furnish materials by manufactures listed, or approved equal, as approved by Architect prior to bidding.

### 2.02 SWIMMING POOL THERMAL COVER

- A. Thermal Cover
  - 1. Furnish and install commercial swimming pool thermal cover compliant with ASTM F1346-91. Subject to requirements herein, provide products manufactured by Spectrum, SR Smith, T-Star Enterprises, or an approved equal.
    - a. Sizes, as required for Pool A (50 Meter Pool), and Pool B (Warm Up Pool)
    - b. Color as selected by Owner/Architect from manufacturers standard colors
    - c. Material UV stabilized woven high-density polyethylene film fabric, minimum 12 by 10 count per square inch, laminated both sides to center core of 1/8" thick, closed cell, medium density white polyethylene foam. The assembly shall be non-toxic, non-absorbent, non-permeable, and buoyant, meeting the following requirements:
      - 1) Foam Density -- 2 lbs. per cubic foot (ASTM D-1910)
      - 2) Weight -- .08 lbs. Per square foot
      - 3) Tensile Strength -- 330 lbs. warp x 290 lbs. welt (ASTM D-751, grab)
      - 4) Tear Strength -- 80 lbs. warp x 84 lbs. welt (ASTM D-751, tongue)

- 5) Burst Strength -- 560 psi
  - 6) UV weathering -- 90% retained strength after 2000 hours exposure (ASTM G-154)
  - 7) Service Temperature -- -40 F to 160 F
  - 8) K Factor -- .25 BTU/sqft/hr degrees/inch (ASTM D2326)
  - 9) R Value -- 4
  - 10) Reinforced edge tear factor -- 1225 lbs., pull strength, corner to corner
  - 11) Grommets -- 305 Stainless Steel, passivated to ASTM A967
- d. Cover panels shall completely cover pool area without gaps or overlaps
  - e. Provide reinforced cutouts where required for rounded corners, steps rails, play features, etc.
  - f. Provide continuous, non-corrosive weighted material sewn into the side panels.
  - g. Reinforce edges with a double layer of polyethylene coated film fabric. Panels shall be designed to prevent division when deployed.
  - h. Reinforce corners with 1/8" thick non-corrosive load dispersion plate and grommet.
  - i. Sewing shall be with UV stabilized, chemical resistant 100% polyester thread, single end strength 21 lbs.
  - j. Seams shall be welded, glued or heat sealed.
  - k. Supply each end of cover panel with non-corrosive grommets (three minimum) and quick release lops for attachment to reel or cover panel.
  - l. Labeling per ASTM F1346, the Federal Consumer Protection Agency, or as required by other Authorities having Jurisdiction shall be permanently affixed to each end of each panel, and to side of perimeter panels.
  - m. Furnish storage cover for each outdoor swimming pool cover storage reel.

### **2.03 SWIMMING POOL COVER STORAGE REELS**

- A. Provide storage reel(s) capable of removing and storing pool covers. Minimize number of storage reels to meet complete cover storage requirements.
- B. Structure: A support frame consisting of type 304 stainless steel (ASTM -554), 1.5" 11-gauge tubing. Strengthen vertical supports with welded structural gussets. Provide minimum 1/4" SS304 plate welded to bottom of frame for caster assemblies.
- C. Winding Reel: Consisting of 4 1/2" OD, 11-gauge, SS30 (ASTM-554), tubing concentrically supported by a solid 1" OD round shaft with machined squared end securely welded to 1/4" SS tube end cap. Shaft shall be compatible with manufacturers automatic motor re-winder. Winding reels longer than 20' shall have center reinforcement. Winding reel shall be capable of supporting pool cover without bowing or bending. Connect tube end caps and other connecting points on winding reel with SS blind rivets.
  1. Provide 1-reel configuration
  2. Provide 2-reel configuration
  3. Provide 3-reel configuration
- D. Provide wheels consisting of four (4), single piece construction, 60 durometer, solid one-piece urethane wheels. Provide with SS304, 1650lb capacity swivel casters on SS304 axel and self-lubricating non-corrosive Delrin bearings and bushings.
- E. Braking Device: Stainless steel, high strength Acme threaded nut and screw housed in SS304 tubing, supported by SS304 bracket. Located devices diagonally at each end of reels to provide lift to restrain reel movement. Contact pad shall be self-leveling for uneven terrain and shall be 3/4" x 9" square long wearing UHMW-PE material fastened to 1/4", 9" square SS304 plate with SS304 hardware.
- F. Winding tool: Fabricate from SS304, 11 gauge (ASTM-554) 1" x1" x 13" structural tube welded to 1" x1" tubing.
- G. Hardware: All hardware SS304:
  1. Bolts 3/8" - 16 thread

2. ¼" blind rivets
- H. Acceptable Products:
1. Spectrum Products
  2. T-Stars by SR Smith

### **PART 3 EXECUTION**

#### **3.01 ACCEPTABILITY OF SURFACES**

- A. Before installation of cover and cover systems, check area for acceptability for cover systems. Report any discrepancies to Contractor and Architect.
1. Wall Mounted systems:
    - a. Verify fit. Check for obstructions which may interfere with cover's proper operation
    - b. Power provision requirements and locations.
    - c. Provision for embedment's at proper locations.
    - d. All surfaces shall be free of dust, rust, paint, from oil or other coatings
  2. Deck Anchored systems:
    - a. Coordinate anchors and embedments on site.
    - b. Anchors/embedments shall be designed to avoid conflict with joints, depth markers and other deck equipment.

#### **3.02 PREPARATION**

- A. Clean substrates.
- B. Wet down or wash dry, dusty surfaces and remove excess water.

#### **3.03 INSTALLATION**

- A. Automatic cover installation, General
1. Mount cover reels at a height to avoid pedestrian traffic and other obstructions when cover fully retracted.
  2. Install cover reels level and true, unless previously designed and reviewed submittals expressly show otherwise.
  3. Comply with manufacturer's installation requirements.

#### **3.04 LAYOUT**

- A. Align seams to give straight uniform appearance.

#### **3.05 WORKMANSHIP**

- A. Install in strict accordance with recommendations and directions of manufacturer.

#### **3.06 CLEANING**

- A. Clean surfaces impacted by cover installation as thoroughly as possible on completion of work.
- B. Use manufacturers suggested products for cleaning cover prior to first deployment.

#### **3.07 PROTECTION**

- A. Provide temporary protection for covers until turned over to pool operator.

### **END SECTION**

**131161  
POOL CERAMIC TILE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Porcelain Ceramic Pool Tile

**1.02 RELATED DOCUMENTS**

- A. Drawings and Contracting Requirements, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

**1.03 REFERENCES**

- A. The following latest edition reference specifications, guides and standards shall become part of this Section as if herein written. If provisions conflict, the more stringent provisions shall apply.
  1. ANSI A108 – Specifications for Installation of Ceramic Tile
  2. ANSI A137.1 – Tile Grade Requirements
  3. ASTM C-150, Type 1 – Portland Cement
  4. ASTM C-206, 7 Type S – Hydrated Lime
  5. ASTM C-144 - Sand
  6. ANSI A118.1 – Dry Set Mortar
  7. TCA 759 – Dry Set Mortar
  8. ANSI A118.3 – Epoxy Adhesive
  9. TCNA – Tile Council of North America, Handbook for Ceramic, Glass, and Stone Tile Installation, latest edition
  10. ISO 13007 – International Standards Organization; Classification for Grouts and Adhesives.

**1.04 SUBMITTALS**

- A. Refer to General Requirements and Division 01.
- B. Submit product data and samples for each tile product indicated.
- C. Submit shop drawings for approval before ordering tile. Include the following:
  1. Plan, elevations, and sections of pool tank and deck.
  2. Indicate tile layout, patterns, color, expansion joints, junctions with dissimilar materials and setting details.
- D. Plans of all tile marking showing exact locations and positions of individual tiles.
- E. Maintenance data: Include routine maintenance and stain removal methods.
- F. Provide five copies of submittals.

**1.05 SUBSTITUTIONS**

- A. Refer to General Requirements and Division 01.

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Refer to General Requirements and Division 01.
- B. Deliver all products to job in manufacturer's unopened containers with grade seals unbroken and labels intact.
- C. Keep tile cartons dry.

**1.07 QUALITY ASSURANCE**

- A. Single source responsibility:
  1. Obtain each type and color tile material from single source.
  2. Obtain setting and grouting materials from one manufacture to ensure compatibility.
  3. Obtain membrane from same manufacturer as setting material or from manufacturer approved by setting material manufacturer to ensure compatibility.



4. Furnish fifteen (15) year guarantee from installation material manufacturer. This guarantee is inclusive of installation materials, finish product, and labor.
- B. Manufacturer Qualifications:
  1. Tile: Minimum five (5) years' experience in manufacture of tile products.
  2. Setting Materials: Minimum ten (10) years' experience in manufacture of setting and grout materials specified.
- C. Installer Qualifications: Specializing in tile work having a minimum of 5 years successful documented experience with finish work comparable to that required for this project.
- D. Certifications:
  1. Submit "Master Grade Certificate" for each shipment, type, and composition of tile, signed by tile manufacturer and installer with requirements of ANSI A137.1.
  2. Submit manufacturers certifications that tile, setting materials, adhesives, and grouts are suitable for intended use in submerged, swimming pool environment.
- E. Field Samples:
  1. Sample Installation:
    - a. For final review of each type of installation, construct sample panel of approximately 100 square feet.
    - b. Install in location as directed by Architect and approved by Owner's Representative.
    - c. Show workmanship of finished work and construction techniques including installation and incorporation of waterproofing membrane. Where a particularly difficult detail or technique is required, or where special sizes or shapes of product are needed, they shall be included in sample panel.
    - d. Approved field samples will serve as project standard and may remain as part of the work.
- F. Pre-Installation Conference:
  1. Require attendance of General Contractor, Pool Contractor, Tile Installer and Installers of related work. Review installation procedures and coordination required with related and adjacent work. Hold meeting at least one week prior to commencing work of this section. Publish meeting minutes within 5 days of meeting, distribute minutes to participants, copy Architect.
  2. Meeting agenda shall include, but is not limited to:
    - a. Surface preparation
    - b. Tile and installation material compatibility
    - c. Edge protection, transition and pre-fabricated movement joint profiles
    - d. Waterproofing techniques
    - e. Crack Isolation techniques
    - f. Environmental requirements
    - g. Finish protection

#### **1.08 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials in manufacturer's unopened containers, fully identified with brand, name, type and grade. Comply with requirements in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location. Protect materials from contamination, dampness, freezing or overheating in accordance with manufacturer's instructions.
- C. Broken, chipped, warped, stained or damaged tile will be rejected.
- D. Store liquid latexes in unopened containers and protect from freezing.

#### **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.

- B. Do not begin installation until construction in spaces is complete and ambient temperature and humidity conditions are consistent with standards and manufacturers written instructions.
- C. Ventilate spaces receiving tile in accordance with manufacturer's instructions.

### **1.10 WARRANTIES**

- A. Contractor shall provide written materials and installation warranty, executed by the contractor, Installer and Manufacturer, agreeing to repair or replace tile that fails in material or workmanship within the specified warranty period to Architect/Engineer prior to filling pool with water.
  - 1. Warranty Period: Two (2) years after Substantial Completion, or manufacturer's system warranty, if longer.
  - 2. Warranty Period: Fifteen (15) years after Substantial Completion, or manufacturer's system warranty, if longer

## **PART 2 MATERIALS**

### **2.01 GENERAL**

- A. ANSI Standard for Ceramic Tile: Provide tile that complies with ANSI 137.1 for types, compositions, and grades of tile indicated.
- B. ANSI Standard for Tile Installation Materials: Provide materials that comply with ANSI standards referenced in "American Standard Specifications for the Installation of Ceramic Tile" with products and materials indicated for setting and grouting.
- C. Furnish ceramic tile required as follows. Colors shall be as selected by Owner and Architect.
- D. Furnish all tiles required for special markings and lettering in conformance with the drawings and applicable Codes, including depth markings and no diving markers.
- E. Racing lane tile edges shall be installed flush with finish pool floor.
- F. Target tile shall be installed flush with finish pool wall.
- G. Use surface bullnose on pool edge where required for proper trim and as directed on the drawings.

### **2.02 POOL CERAMIC TILE**

- A. Indoor Pool Ceramic Tile
  - 1. Myrtha, Dal-Tile - Keystone or equal as scheduled.
    - a. Provide impervious tile with water absorption rate of less than .5% per ASTM C373. Sizes, types, and slip resistance as scheduled, see pool drawings
    - b. Color as selected by Owner/Architect (see Architect's tile selection schedule).
    - c. Provide special shapes, bullnose and other tile as required.

### **2.03 MORTAR, GROUT AND ADHESIVE MANUFACTURERS**

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers or an approved equal:
  - 1. Custom Building Products, Huntington Beach, CA.
  - 2. Laticrete International, Inc., Bethany, CT.
  - 3. MAPEI Corporation, Deerfield Beach, FL.

### **2.04 MORTAR MATERIALS: THICK SET**

- A. Latex – Portland Cement Mortar: Thick Set (ANSI A118.4)
- B. Description: Two component system; latex additive water emulsion added to Portland cement mortar in place of water or replacing part of the water. The dry-set mortar must be pre-blended and must be specified by the latex manufacturer for use with the particular latex additive. Use amount of liquid latex recommended by latex additive manufacturer.
- C. Acceptable Products:
  - 1. Thick Bed Mortar mixed with Patching & Leveling Latex Additive, by Custom Building Products

2. Laticrete 226 thick bed mortar mixed with Laticrete 3701 Mortar Admix, by Laticrete International.
3. MAPEI, 4 to 1 Mud Bed Mix mixed with MAPEI, Planicrete AC, by MAPEI Corporation.

#### **2.05 MORTAR MATERIALS: THIN SET AND SLURRY BOND COAT**

- A. Improved Modified Dry-Set Cement Mortar: Thin Set (ANSI A118.15)
- B. Description: Two component system; latex additive water emulsion added to Portland cement mortar in place of water or replacing part of the water. The dry-set mortar must be pre-blended and must be specified by the latex manufacturer for use with the particular latex additive. Use amount of liquid latex recommended by latex additive manufacturer.
- C. Acceptable Products:
  1. Laticrete 254 Platinum thin set mortar by Laticrete International.
  2. Keralastic System consisting of Keralastic polymer additive and Kerabond dry-set mortar by MAPEI Corporation.

#### **2.06 EPOXY GROUT**

- A. Multi-component, factory prepared, 100 percent epoxy resin and hardener with sand or mineral filler material. (ANSI A118.3)
- B. Acceptable Products:
  1. CEG-Lite by Custom Building Products
  2. Laticrete SpectraLock Pro Grout by Laticrete International.
  3. Kerapoxy CQ by MAPEI Corporation.

#### **2.07 ELASTOMERIC JOINT SEALANT**

- A. Provide as required by TCNA guidelines, and as indicated on drawings, conforming to ASTM 920 and ASTM C 794
- B. Acceptable products:
  1. Commercial 100% Silicone Sealant by Custom Building Products
  2. Latasil by Laticrete International
  3. Mapesil by MAPEI Corporation

#### **2.08 ANTI-FRACTURE/ WATERPROOFING MEMBRANE**

- A. Multi-component, factory prepared, anti-fracture/ waterproofing membrane system comprised of a self-curing liquid rubber polymer
- B. Acceptable Products:
  1. RedGard by Custom Building Products
  2. Laticrete Hydroban by Laticrete International.
  3. Mapelastic AquaDefense by MAPEI Corporation.

#### **2.09 WALL PATCH & RENDER MORTAR**

- A. Quick-Setting, Fiber-Reinforced, Cementitious Patch and Render Mortar.
- B. Acceptable Products:
  1. Custom Float Bedding Mortar by Custom Building Products
  2. Laticrete 3701 Fortified Mortar Bed by Laticrete International
  3. Planitop 330 Fast by MAPEI Corporation.

#### **2.10 MISCELLANEOUS MATERIALS**

- A. Temporary protective coating: Provide product that is formulated to protect exposed surfaces of tile against adherence of mortar and grout, is compatible with tile and mortar/grout products, and is easily removable after grouting is completed without damaging grout or tile.
  1. Grout release in form of manufacturers standard propriety liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.
- B. Acceptable Products:
  1. Aqua Mix Grout Release by Custom Building Products

2. Stonetech Grout Release by Laticrete International.
  3. UltraCare Grout Release by MAPEI Corporation.
- C. Epoxy Grout Haze Remover.
1. Aqua Mix Non-cement Grout Haze Remover
  2. Stontech Epoxy Grout Haze & Coating Stripper by Laticrete International
  3. UltraCare Epoxy Grout Haze Remover by MAPEI Corporation

### **2.11 MIXING MORTAR AND GROUT**

- A. Mix mortars and grouts in accordance with manufacturer's instructions.

### **2.12 EXTRA MATERIALS**

- A. Supply extra 5% of each color of flat and trim in clean marked cartons for Owner's use.

## **PART 3 EXECUTION**

### **3.01 ACCEPTABILITY OF SURFACES**

- A. Before tiling, check area to be tiled for acceptability as follows:
1. Surface medium-rough texture.
  2. All surfaces to be tiled shall be free of dust, rust, paint, from oil or other release coatings.
  3. Provision for ladders and other embedments at proper locations.
  4. Concrete true to line, level, plumb and curvature.
  5. Width, depth and length will permit finished accuracy of markings and dimensions.
  6. Verify surfaces for compatibility with tile setting material manufacturer's requirements prior to installation.

### **3.02 ENVIRONMENTAL CONDITIONS**

- A. Protect all newly tiled areas.
- B. Maintain temperature at 50 degrees F minimum during tile work and for seven days after completion or furnish protection as approved by the Architect/Engineer.

### **3.03 PREPARATION**

- A. Clean substrates.
- B. Wet down or wash dry, dusty surfaces and remove excess water immediately prior to tile applications.
- C. Install slurry bond coat.
- D. Do not seal substrate unless required by manufacturer.
- E. Prime substrate if required by manufacturer.

### **3.04 INSTALLATION**

- A. Tile installation, General
1. Install tile materials in accordance with ANSI A137.1, other reference ANSI or TCNA specifications, and TCNA "Handbook For Ceramic, Glass, and Stone Tile Installation", except for more stringent requirements of manufacturer or these specifications.
  2. Cut and fit tight to protrusions and vertical interruptions.
  3. Work tile joints uniform in width, subject to variance in tolerance in tile size. Make joints watertight, without voids, cracks, excess mortar or grout.
  4. Prepare surface, fit, set, bond, grout and clean in accordance with applicable requirements of ANSI standards and Tile Council of North America.
  5. Floors and walls: dry set: TCNA F113, F115, and W202E.
  6. Comply with tile setting material manufacturer's installation requirements.
- B. Thin set method
1. Apply mortar or adhesive with notched trowel using scraping motion in single direction to work material into good contact with surface to be covered. Back bed tiles with mortar. Maintain 95 percent coverage on back of tile and fully bed all corners.

2. Apply only as much mortar or adhesive as can be covered within allowable windows as recommended by mortar or adhesive manufacturer or while surface is still tacky.
  3. Set tile in place and rub or beat with small beating block.
  4. Beat or rap tile to ensure proper bond and also to level surface of tile.
  5. Align tile to show uniform joints and allow to set until firm.
  6. Clean excess mortar or adhesive from surface of tile with wet cheesecloth while mortar is fresh.
  7. Sound tile after setting. Replace hollow sounding tiles.
- C. Thick Set Method
1. Apply slurry bond coat.
  2. While the slurry bond coat is wet, spread the mortar and compact well.
  3. While slurry bond coat is wet and sticky, set tile in place and beat in well.
  4. Beat or rap tile to ensure proper bond and also to level surface of tile.
  5. Align tile to show uniform joints and allow to set until firm.
  6. Clean excess mortar or adhesive from surface of tile with wet cheesecloth while mortar is fresh.
  7. Sound tile after setting. Replace hollow sounding tiles.
  8. Maintain ambient temperature above 50 F and below 100F for 72 hours after installation.
- D. Grouting
1. Allow tile to set a minimum of 72 hours before grouting.
  2. If bonding materials are rapid setting, follow manufacturer's recommendations.
  3. Install in accordance with grout manufacturer's recommendations and ANSI A108.10.
  4. Pack joints full and free before mortar takes initial set.
  5. Clean excess grout from surfaces per manufacturer recommendations, as work progresses.

### 3.05 LAYOUT

- A. Align all joints to give straight uniform grout lines.
- B. Observe exact minimum length per dimensions shown on Contract Drawings.
- C. Observe exact minimum width per dimensions shown in Contract Drawings.
- D. Observe +/- 1/16" maximum finish elevation tolerance on all gutter edges.
- E. Provide expansion joints per TCNA EJ171.

### 3.06 WORKMANSHIP

- A. Supply first-class workmanship in all tile work.
- B. Use all products in strict accordance with recommendations and directions of manufacturer.
- C. Proportion all mixes in accordance with latest ANSI Standard Specifications.
- D. Smooth all exposed cut edges.
- E. Gutter edges shall not vary from level or true plane more than 1/8" of pool static water level.

### 3.07 CLEANING

- A. Clean excess mortar from surface with water as work progresses.
- B. Clean tile surface as thoroughly as possible on completion of grouting, preform cleaning while mortar is fresh and before it hardens on surfaces.
- C. Before acid cleaning, saturate with clean water all grout joints in areas to be cleaned.
- D. Use manufacturers suggested products for cleaning off grout film.
- E. Remove temporary protective coating by method recommended by coating manufacturer. Trap and removing coating to prevent it from clogging drains.

### 3.08 PROTECTION

- A. Prohibit traffic from tile finish for 72 hours after installation.
- B. Protect work so that it will be without any evidence of damage or use at time of acceptance.
- C. Allow tile finish to set for 14 days prior to submerging tile.

**3.09 TILE SCHEDULE**

- A. See Tile schedule, following Pool Drawings], for tile information.

**END SECTION**

**131165  
WATER FLUME RIDES**

**PART 1 GENERAL**

**1.01 POOL ASSOCIATED BID ALTERNATES INCLUDE:**

- A. BID ALTERNATE #3 – Splashtacular Fly Time Slide (Slide C) – This slide is associated with Pool A. The Bid Alternate #3 shall include all Splashtacular materials (fiberglass, concrete slide foundations, steel support columns and necessary hardware to complete a full installation of the Fly Time slide. The Base Bid for this slide system shall include the pump pad and associated suction piping from the surge tank into the pool pump pit, supply piping to the slide tower location including piping stub up to 24” above deck elevation and capped. Additional piping associated with the slide drain system shall be installed from the gutter piping tees to a point 6’ out of the gutter system tee – cap and terminate 12” below deck. Slide Tower is shared with Slide A and Slide B and is base bid.

**1.02 DESCRIPTION:**

- A. Scope of Work: Work shall include the furnishing of all labor, materials, equipment, engineering expertise and other incidentals to the construction of the water slides:
  - 1. See drawings for waterslide layout and general requirements of:
    - a. Two (2) Outdoor body flume rides and associated slide tower complex. Slides are associated with Pool C.
    - b. One (1) Outdoor body flume ride (slide tower shared with Pool C slides) Basis of Design is a “Fly-Time” slide is associated with Pool A. THIS IS BID ALTERNATE #3.
  - 2. “Waterslide” elements shall include but not be limited to:
    - a. Fiberglass flume components.
    - b. Flume support system.
    - c. Starting platform, all stairways and railings and steps as necessary to enter ride.
    - d. Deck mounted barrier system (matching tower railing) preventing patron access to all overhead waterslide structure that is less than 7’-0” above the deck.
    - e. Slide supply piping supports integrated into the slide and tower support systems and coordinated with the aquatic engineer.
    - f. Concrete footings and foundations.
- B. Delegated Design: The waterslide manufacturer is responsible for a project site-specific design of the waterslide elements as outlined above and herein. See ‘Delegated Design’ definition in Specifications Section 13 11 13 POOL GENERAL.
- C. Work Provided Elsewhere in the Specifications or on the Drawings:
  - 1. Furnish and install pumps for water supply to the slide and all necessary piping including deck mounted sumps for runout slides as specified by the successful water flume ride bidder.
  - 2. Cut-outs in pool wall to accept slides.
  - 3. Patch in and waterproofing of entry sections into the pool after installation of the slide.
  - 4. Pool and deck structure around slide foundation and columns.
  - 5. Refer to Division:
    - a. Earthwork - 31.
    - b. Concrete - 03.
    - c. Pool - 13.
    - d. Electrical - 26.
  - 6. Refer to General & Supplementary Conditions - This contractor shall be bound by the General and Supplementary Conditions.

**1.03 CODES AND STANDARDS**

- A. All elements of the Water Flume Ride (including but not limited to flumes, tower structure, flume supports and starting platform, stairways and railings shall be designed and installed to

conform to all applicable requirements, including the following. See Drawings for applicable Code/Standard version:

1. The California Division of Occupation, Safety and Health (DOSH). SLIDE MANUFACTURER SHALL PROVIDE "DOSH" ALL NECESSARY PHYSICAL SAMPLES, DESIGN CALCULATIONS AND DOCUMENTATION, AND FINAL RIDE TESTING FOR SLIDES AS REQUIRED BY "DOSH" TO SECURE THE SLIDE/S OPERATIONAL PERMIT.
2. The Department of Public Health, and all other state and local health and building codes.
3. WWA Considerations for Operating Safety, published by World Waterpark Association.
4. ASTM-F2376-08 "Standard Practice for Classification, Design, Manufacture, Construction, and Operation of Water Slide Systems".
5. Suggested Health and Safety Guidelines for recreational water slide flumes, published by U.S. Department of Health and Human Services.
6. American Institute of Steel Construction. AISC Steel Construction Manual.
7. American Concrete Institute. ACI 318-14 Building Code Requirements for Structural Concrete.
8. American Society of Civil Engineers. ASCE 7-10 Minimum Design Loads for Buildings and Other Structures.
9. International Code Council. International Building Code.
10. American Institute of Steel Construction. Steel Design Guide 1; Base Plate and Anchor Rod Design.
11. American Concrete Institute. ACI 301-10 Structural Concrete for Buildings.
12. American Concrete Institute. ACI SP-066, 04 Detailing Manual.
13. Applicable local, provincial, or state building codes.

#### **1.04 SITE CONDITIONS**

- A. Topography - The drawings indicate the location and building information pertaining to the site for Water Flume.
- B. Soils - Refer to Division 02.

#### **1.05 USE OF SITE**

- A. General
  1. The contractor will restrict his construction to the general area shown on the drawings.
  2. Access and egress shall be coordinated with the general contractor and controlled so as not to conflict with the normal operations of the project.
- B. Design
  1. The design, shown on the drawings show the intended use and desired locations of the elements in relation to the adjacent deck uses.
  2. The slide manufacturer, in providing its bid, warrants that it is licensed to do work in the project's state and municipality and holds appropriate professional registrations, permits and/or meets other requirements by authorities having jurisdiction.
  3. The slide manufacturer shall indemnify and hold harmless the architect and the owner from any and all actions caused by or related to the design, fabrication and installation of the work of this specification section.

#### **1.06 PERMITS & FEES**

- A. The manufacturer and/or the contractor shall provide sufficiently detailed information on all items furnished to secure all necessary permits, including but not limited to:
  1. Building permit. (Including structural calculations upon request).
  2. California Division of Occupation, Safety and Health. (DOSH).
    - a. The slide manufacturer shall provide "DOSH" all necessary physical samples, design calculations and documentation, and final ride testing for slides as required by "DOSH" to secure the slide/s operational permit.
  3. State Department of Public Health construction and operating permits



4. Local County and/or municipal health department construction.
- B. All applicable fees and permits for construction will be paid for by the contractor(s) and shall be included in the bid price. The Department of Public Health construction permit for the swimming pools will be paid for by owner.

#### **1.07 JOB CONDITIONS**

- A. Protection:
  1. Use all means necessary to protect existing work and, in the event of damage, immediately make all repairs and replacements necessary, subject to approval of the architect/engineer and at no additional cost to the owner.
- B. Store Products:
  1. Contractor shall assume full responsibility for the protection and safe keeping of products under this contract stored on the site.
- C. Lines, Levels and Layout of Work:
  1. The contractor shall establish and guarantee all lines, levels, etc. called for on the drawings.
  2. The contractor shall be responsible for the lines, levels, etc. of all his subcontractors.

#### **1.08 SUBMITTALS**

- A. Submit in accordance with Division 0.
- B. Construction Schedule:
  1. The contractor will cooperate with scheduling determined for the complete job so as not to create any delays or slowdown of other contractors.
- C. Shop Drawings:
  1. Promptly after award of the contract, the contractor shall submit complete engineered shop drawings to include, but not be limited to:
    - a. Course layout with dimensions.
    - b. Slide path design with X,Y,Z (elevation) coordinates.
    - c. Flume component details, including interface at slide entry and exit.
    - d. Flume structural support system.
    - e. Foundation plans and details as required for flume structural support. Foundation shall be designed as required by the geotechnical report. Top of pedestal shall be above finished grade.
    - f. Mechanical Piping Schematic.
    - g. Tower and stair details, including foundations, structural support, bracing, and starting chute as indicated on the plans.
    - h. Modifications to plunge area, if any, required for the safety of the contractor's slide path design.
    - i. Modifications to the slide pumps, if any, required for the contractor's slide path design.
  2. All shop drawings shall be certified and sealed by a structural engineer, registered and licensed in the project state.

#### **1.09 GUARANTEE/WARRANTY**

- A. Labor and Material Payments Bonds: The contractor may be required to furnish bonds equal to the total contract amount guaranteeing the payment of all labor and materials. See General Project Requirements.
- B. Special Project Requirements: Manufacturer agrees to provide evidence of product liability insurance naming the owner, architect and Water Technology, Inc. as additional insured. This insurance will be maintained for a minimum of five (5) years or as required by statute, whichever is greater. In addition, the manufacturer agrees to indemnify, hold harmless, and defend the owner, the architect and Water Technology, Inc. including their agents and employees for any and all claims, damages, losses and expenses of whatsoever nature, including but not limited

to claims for property damage, personal injury (including death), attorneys fees, litigation expenses, court costs and all other damages arising out of or incidental to, resulting from or in connection with performance of this manufacturer's work.

- C. Qualification of Workmen: At least one (1) person who is thoroughly familiar with the materials, methods and equipment being utilized shall be present at all times during the construction to direct the work where required.
- D. All work of this section shall be warranted against all defects of material and/or application for a period of one (1) year from date of acceptance. Any failures that may occur within this warranty period, due to defective installation and/or materials, shall upon written notification of such failure be repaired or replaced in a timely manner. The exterior of the fiberglass parts that are exposed to view shall have a three (3) year color retention limited warranty such that the parts will not exhibit more than 15% color degradation during the warranty period.
- E. Approved Manufacturers - The following manufacturers have submitted sufficient information to be pre-qualified as sources of water flume equipment:
  - 1. PROSLIDE TECHNOLOGY, INC., 2650 Queensview Dr. Suite 150, Ottawa, Ontario, CANADA K2B 8H6, (613) 526-5522.
  - 2. SPLASHTACULAR Operations Facility Kansas: 102 W. Kaskaskia, Suite 201 Paola, KS 66071 (800) 844-5334; Corporate Office – California 78-670 Hwy 111, PMB 225 La Quinita, CA 99253.
  - 3. WHITEWATER WEST INDUSTRIES, 655 S. Sunset Street Suite E Longmont, CO 80501; (702) 405-6040.

## **PART 2 PRODUCTS**

### **2.01 FIBERGLASS FLUME COMPONENTS**

- A. General: The fiberglass flume components are those various elements that compose the water flume and include:
  - 1. Starting Section.
  - 2. Curved Sections.
  - 3. Straight Sections.
  - 4. Drop or Accelerating Sections and Deceleration Sections.
  - 5. Built-up Sections Including Lead-ins and Lead-outs.
  - 6. Exit Section or End Section.
  - 7. All other incidental fiberglass components necessary for a complete system.
  - 8. All sections shall be bolted and caulked. No fiberglass joints allowed.
- B. Fiberglass Laminate Materials:
  - 1. Gelcoat: Interior gel coat shall be "crystal clear" high quality isophthalic polyester with U.V. inhibitors. 20 mils thickness. Exterior coat 20 mils wet clear gloss U.V. protective coating.
  - 2. Resins: Thixotropic promoted low profile polyester resin with alternate layers of continuous roving chop and 18 oz. woven roving. No fillers shall be allowed in fiberglass laminate materials.
  - 3. Structure: Fiberglass lamination with sandwich panel center line reinforcement. Standard flume section shall be 3/16" thick, minimum weight 20 oz. per square foot. Flanges shall be minimum 1/4" thick and extend at least 3-3/4" from the slide surface, "L" type.
- C. Joints, Connections and Seams:
  - 1. Flume to flume joints shall be fastened with hot-dipped galvanized steel bolts, washers (2 per bolt), and lock washers per the slide structural engineer's drawings and specifications.
  - 2. Flume to support system connections shall be made with hot-dipped galvanized steel hardware and shall be connected separately from water slide section connections.
  - 3. Fiberglass joint connections shall be made watertight using waterproof non-shrink marine grade caulking with suitable adhesion to fiberglass. Silicone sealants will not be permitted.
  - 4. Joint sealant/adhesive material: Premium-grade, high-performance, moisture-cured, 1-component, polyurethane-based, non-sag elastomeric sealant.
  - 5. Products:

- a. Sikaflex®-1A with Sikaflex Primer 449,
  - b. 3M 5200,
  - c. Alternative manufacturers standard to the slide manufacturer specifications and approved as equivalent by architect/engineer.
6. Laminating fiberglass or gel coat over seams within the riding surface is not permitted. Sanding within the riding surface should be minimized to maintain adequate gel coat thickness and gloss. Any sanded areas shall be polished to a high gloss until undetectable.
- D. Color:
1. Shall be as standard to the manufacturer, and approved by architect/engineer, integral to the fiberglass and may be different color on the inside and outside or staggered per piece. Verify color selection with architect and owner.
- E. Ride Configuration:
1. The slide length and configuration shall be as indicated in the drawings.
  2. Alternate configurations will be considered if rides commence and terminate at the same location/elevation, are of the same length and configuration, and all other features of the specifications are met.
- F. Required Components: All slides shall be furnished with the following components:
1. Entry tray shall be pre-plumbed for water injection down-stream of the rider entry point. Rider entry area shall be a non-skid surface, no steps are permitted.
  2. Factory pre-drilling of all sections.
  3. Waterproof joint sealant as specified in Article 2.01.C.
  4. Hot-dipped galvanized steel assembly hardware as specified in Article 2.01.C.
  5. Riser sections are required on all curved open flume sections for rider safety and to control water loss.
  6. Riser ends will provide a smooth transition at the beginning and end of each riser.
  7. Flume shall be perpendicular to the pool wall for at least 10' from its end and shall not slope greater than one foot vertically in the last 10' and meet State code requirements.
  8. End cap sections shall provide a smooth finish end piece which provides safe pool entry and masks connection to the pool. The end cap section shall terminate between 6" below and 2" above the water level and meet State code requirements. End cap section shall have a skirt returning to pool wall.
  9. Fiberglass sections will be factory pre-drilled.
  10. Fiberglass to fiberglass assembly hardware shall be hot-dipped galvanized steel.

## **2.02 FLUME SUPPORT, TOWER AND STAIR SYSTEM**

- A. General: The flume support tower and stair system shall consist of all elements necessary to safely and securely support the fiberglass water flume from the starting platform to the plunge pool or runout and consists of:
1. Concrete footings and foundations, including excavation, backfill and compaction.
  2. Concrete supports.
  3. Factory painted hot-dipped galvanized steel and/or Structural Grade FRP (fiber reinforced plastic) tower and stair system. Follow paint manufacturer's specifications for surface preparation.
  4. Slide Tower barrier and deck barrier to match slide tower.
  5. All connecting hardware, including "Acorn" style cap nuts on all bolts accessible to the public.
- B. Design: The supports and footings shall be certified by a licensed structural engineer in the project state for the soil conditions as indicated, and the stresses generated by the water flume ride during use.
- C. Concrete
1. Cast-in-place: Minimum compressive strength shall be 3,000 psi at 28 days. Maximum size aggregate shall be 3/4 inch. Slump shall not be more than 3 inches. Concrete shall

be vibrated but not to excess so as to cause segregation of materials. Check all applicable drawings for locations of blockouts, anchors, inserts, etc. before concrete is placed.

2. Reinforcing Steel:
  - a.  $F_y = 60,000$  psi min., for: ASTM A615 (deformed bar) or equivalent. ASTM A82 (welded wire fabric) or equivalent.
3. Unless otherwise noted, concrete cover of reinforcing shall be as follows: Footing 3 inches and walls, pedestals, and columns 1 ½ inch minimums.
4. All concrete procedures to conform to latest ACI Building Code.
5. Steel reinforcing lap splices for concrete slab shall be a minimum of 36 bar diameter.

D. Structural Steel

1. Shall consist of radial arms with end yoke type fastening assembly for each support point. (NOTE: A central column support with radial arms may be used to support circular sections of 180 degrees or greater.)
2. Structural steel shall be new material of sizes and shapes listed in current AISC handbooks and as indicated on drawings.
3. Shapes and plates: ASTM A36 or equivalent minimum  $F_y = 36,000$  psi (248.2 MpA).
4. Square structural section: ASTM A500 minimum  $F_y = 46,000$  psi (317 MpA).
5. Round steel pipes: ASTM A53 grade B minimum  $F_y = 35,000$  psi (241.3 MpA).
6. Cast steel: ASTM A27 minimum  $F_y = 36,000$  psi or equivalent.
7. Tension rods, bolts, and anchor bolts: ASTM A36 minimum allowable tensile stress  $F_t = 19,100$  psi (131.7 MpA).
8. Structural bolts: ASTM A325, friction type or equivalent minimum allowable shear stress,  $F_v = 21,000$  psi (144.8 MpA). Minimum allowable tensile stress,  $F_t = 44,000$  psi (303.4 MpA).
9. Welding electrodes: E480XX electrode (E70XX). Minimum allowable shear stress,  $F_v = 21,000$  psi (144.8 MpA).
10. Grout: Masterflow 713 or approved equal non-shirk, non-metallic grout. Use as recommended by manufacturer.
11. All plates, shapes and tubes in contact are to be welded with ¼-inch minimum fillet welds all around unless otherwise indicated.
12. Unless otherwise noted all steel structure shall be hot-dipped galvanized.
13. Contractor shall supply temporary bracing to take care of all loads on the structure during erection to ensure the safety of the structure, leave as long as is required, remove when safety is assured.
14. All flumes and support arms shall be properly set and installed prior to installation of permanent column bracing. Additional column bracing as required by engineer, in addition to those noted on the drawing, shall be provided upon site inspection.
15. All hollow structural sections shall be closed airtight with end plates sealed with welds.
16. All steel shall be thoroughly cleaned of all loose mill scale, loose rust, oil and dirt.
17. Surface to be welded shall be free from loose scale, rust, paint or other foreign matter. Care shall be taken to minimize stresses due to heat expansion, contraction and distortion by using proper sequence in welding and by other approved methods.
18. Fabrication and erection shall conform to the latest editions of the ASTM Specifications and Code of Practice: Welding shall be done by welders certified with AWS D-1.1.
19. Equivalent structural steel sizes listed in current AISC or CISC Handbook may be used upon approval of the architect/engineer.
20. Definitions:
  - a. ASTM - American Society of Testing Materials.
  - b. AISC - American Institute of Steel Construction
  - c. CISC - Canadian Institute of Steel Construction

E. Column System

1. A single or multiple concrete post system shall be used.

- F. Starting Tower/Stairway/Railing
1. General -The starting tower/stairway shall consist of:
    - a. A factory painted hot-dipped galvanized tower and stair support system with Duradek T-1800 or fiberglass grating. Risers shall be closed.
    - b. All stair treads shall have a step edge of a contrasting color.
    - c. Powder Coated aluminum grab/hand rails on both sides of entire stair tower. Color Selection by Owner/Architect.
    - d. Bracing and structural support (non-corrosive).
  2. Design
    - a. The structured design shall be certified by an engineer licensed in the project state. Structure shall be sized to handle the user volumes, the height required by the flume length, and the location on the existing topography.
    - b. Stair design shall follow current State building codes.
    - c. Coordinate with slide manufacturer.
  3. Concrete Footings & Piers
    - a. Shall be designed and constructed to support the design loads.
    - b. All concrete shall have a minimum twenty-eight (28) day compressive strength of 4,000 psi.
    - c. All footings shall be on undisturbed soil.
    - d. Vertical members shall be on concrete footings, above grade and be secured with flange plates and anchor bolts.
  4. Hardware
    - a. Steel Hardware, ASTM A-7 or A-36 (hot dipped galvanized).
    - b. Bolts, Federal Specification FF-B-SC1.
    - c. "Acorn" style cap nuts shall be furnished and installed on all bolts accessible to the public. Cap nut material shall match bolt material or shall be nylon material white or black to best match slide tower.
  5. Starting Tower
    - a. Shall be factory painted hot dipped galvanized steel. Slides shall be supported by painted hot dipped galvanized steel columns. Coordinate design with building structural engineer, civil engineer, plumbing engineer, pool engineer, and slide manufacturer.
    - b. Shall have Duradek T-1800 or Fibredek fiberglass grate, decking, treads, and closed risers.
  6. Stairs, Railings, and Barriers
    - a. Stairs shall have factory painted hot dipped galvanized steel stringers with fiberglass grating treads and closed panels. Stairs shall have four foot minimum width.
    - b. Rail system shall be a minimum of 42" high at any point, non-climbable and designed to prevent accidental exit. Handrails shall be located at 34" above stair riser. Color selection by architect and owner.
    - c. The stair entry shall be provided with a 42" high lockable gate of similar construction as the rail system.
    - d. On deck slide barrier system on the deck shall be furnished and installed to prevent access beneath all slide components that are located 7' or less above the deck. Unless otherwise approved by Pool Engineer, the on deck slide barrier shall match the slide tower rail system materials and color, shall be a minimum of 42" high and shall have no greater than a 2" clearance from deck to bottom of barrier rail.
  7. Finish
    - a. All galvanized metal:
      - 1) Wash all galvanized to be painted with a simple green soap, rinse thoroughly.
      - 2) Clean galvanized surfaces with Xylene, which will leave a whitish film - do not remove film.
      - 3) Prime galvanized with Devoe Tru-Glaze Epoxy Primer # 12735/12702, following manufacturer's instructions.

- 4) Finish coat to be Devoe Deythane 369 Aliphatic Urethane Gloss Enamel #369-K-XXXX, following manufacturer's instructions - color by owner.
- 5) Second coat may be necessary, depending on appearance of first finish coat; second coat to be Devoe Deythane 369 Aliphatic Urethane Gloss Enamel #369-K-XXXX.
- b. All ferrous metal parts:
  - 1) Surface Preparation: Blast all surfaces to be coated to the extent of an SSPC-SP6 commercial-grade level of cleanliness. Create a 1.5 - 2.0 mil profile and prime before any rust bloom forms on the surface.
  - 2) Primer: Spray apply, in the shop, one full coat of Tnemec Series 90-97 Aromatic Urethane Zinc-Rich or Amercoat 68 HS primer to a DFT of 4.0 mils. Allow to cure as per data sheet (4 hours @ 75°F) before applying topcoat.
  - 3) Topcoat: Spray apply in the shop one even finish coat of Tnemec Series 74-Color Endura-Shield. Acrylic Polyurethane or Ameron PSX-700 finish to a minimum DFT of 5.0 mils. Allow to cure as per data sheet (6 hours @ 75°F) before handling/loading in the shop.
  - 4) Field Touchup: If the broken area of the shop applied film is rough from scaring, disc-abrade that area smooth and then solvent clean it as per an SSPC-SP1, level of cleanliness. Brush or roller apply one coat of Tnemec Series 135 Chembuild or Ameron epoxy primer. Allow to cure as per data sheet. Brush or roller apply one coat of Tnemec Series 74 or Ameron PSX-700 shop applied color to bring the film up to specification thickness.
- c. Fiberglass handrail posts:
  - 1) Finish: Tnemec Series 74 or Ameron PSX-700 shop applied at 5.0 mils DFT.
  - 2) Field Touch-up: Tnemec Series 74 or Ameron PSX-700 shop applied at 5.0 mils DFT.
  - 3) Manufacturer: Tnemec 816/483-3400 or Amercoat 800/244-0025 or pre-approved equal.
- d. Top deck and landing shall have a non-slip finish.
- e. Treads non-slip shall have a non-slip finish.
- f. All exposed concrete vertical surface shall have a sack rubbed finish.
- g. Seal all concrete with a minimum of two (2) coats of slip resistant Concrete Sealer.
- h. Colors shall be as selected by the architect and owner.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. The installation of this work shall comply with the following governing and regulatory authorities.
  1. Department of Labor (OSHA).
  2. State Department of Public Health.
  3. All State and Local Building Codes.
  4. Any other agency that has legal jurisdiction.

#### **3.02 FLUME CONSTRUCTION**

- A. All construction shall conform to the recommendations of the approved manufacturer selected through this bidding process.
- B. The manufacturer shall be responsible for the quality of the flume material and equipment.
- C. The slide manufacturer shall be responsible for the layout, assembly and erection of the flume products in a workmanlike manner.
- D. Apply the specified joint sealant adhesive in between each flange and in between each splashguard connection. Apply sealant and finish to leave a smooth, leak-free joint/seam.
- E. Flume flanges shall be bolted together with 3/8 inch diameter bolts. All connectors shall be hot-dipped galvanized steel.
- F. Flume joints shall be properly connected so as to avoid abrupt edges that may cause irritation.

- G. Fiberglassing over seams within the riding surface is not permitted. Sanding within the slide surface should be minimized to maintain adequate gel coat thickness and gloss. Any sanded areas shall be polished to a high gloss until undetectable.
- H. All flumes shall be properly cleaned and surfaces smooth finished, and complete with all the necessary sections prior to use of the slide.
- I. All flumes underground shall be carefully backfilled to prevent the flumes from getting damaged. All fill in contact with flume shall be of good quality and free of boulders.
- J. Flumes shall be inspected by the representative of the slide manufacturer to ensure a smooth finish prior to acceptance of work.

**3.03 RIDE COMMISSIONING - PROVIDED BY SLIDE MANUFACTURER WITH COOPERATION & ASSISTANCE BY POOL CONTRACTOR**

- A. The slides and rides shall be started and fully commissioned by a qualified agent employed by the Slide Manufacturer and in cooperation with the General Contractor & Owner. The Slide Manufacturer's commissioning requirements shall consist of all activities necessary to provide a fully functioning and safely operating ride ready for public use and include the following documentation for the Owner's reference:
  - 1. Start-up of pumps including setting and recording (frequency or RPM) of variable frequency drive speeds.
  - 2. Setting, recording (% open) and marking of all operating and balancing valve positions at the pump locations, slide tower, and all slide supply connection locations.
  - 3. Recording of all ride supply pump pressure and vacuum gauge readings (psi or in. Hg) at the time of the approved and commissioned slide flows and valve settings.
  - 4. Recording of all ride supply flow meter readings (GPM) at the time of the approved and commissioned slide flows and valve settings. Coordinate this work with the pool contractor to assure flow meter installations are complete and properly functioning prior to final commissioning.
  - 5. Recording and marking of approved water level ranges in the slide start tub. Mark levels with a line and/or record the measurement in inches above the floor.
  - 6. Setting and recording of the Prosplash Runout overflow weir plate, if applicable.
  - 7. Recording and marking of approved water level ranges in the slide Prosplash Runout structure, if applicable. Mark levels with a line and/or record the measurement in inches above the floor.
  - 8. Provide a written commissioning report that includes the following information for each slide:
    - a. Narrative on the slide operation including recommended loading procedures and operation through all sequences.
    - b. Record summary in table format of all data collected in Items 1 through 8 in Part 3.04(A).
    - c. Date, time, and initials of commissioning agent for each recorded item 1 through 8 in Part 3.04(A).
    - d. Name, signature, and date of the Commissioning Agent responsible for all work above.

**3.04 OWNER INSTRUCTION - PROVIDED BY SLIDE MANUFACTURER**

- A. Provide an experienced ride operator-instructor employed by the Ride (Slide) Manufacturer for operations and start-up after the slide has been placed into operation. During this period, the Owner's designated representative(s) shall be thoroughly instructed in all phases of the ride's operation, including but not limited to:
  - 1. Rider Rules
  - 2. Ride start-up and shutdown procedures.
  - 3. Vehicle dispatching.
  - 4. Rider loading and unloading.
  - 5. Vehicle handling and loading to conveyor, if applicable.

6. Conveyor operations, if applicable.
  7. Water filling & emptying of Prosplash Runout, if applicable.
  8. Ride winterizing procedures, if applicable.
  9. Ride maintenance requirements & procedures divided into the following:
    - a. Daily
    - b. Weekly
    - c. Monthly
    - d. Seasonally
    - e. Annually
- B. The slide manufacturer shall deliver one Operating and Maintenance (O&M) Manual in electronic file format (.pdf) to the Architect/Engineer/Owner for review and approval, and four complete hard-copy sets of the approved documents to the Owner. O&M Manual shall include, but is not limited to the following:
1. Narrative on the slide operation including recommended loading procedures and operation through all sequences.
  2. Recommended user requirements including recommended signage and height and weight restrictions
  3. Written slide warranty and contact information.
  4. A written summary of all information provided during the Owner's Instructions per Section 3.04.A., including maintenance information and recommended maintenance program.
- C. A written Slide Commissioning Report, per the requirements of Section 3.03A.(8).

**END SECTION**