

PROJECT MANUAL

Addendum 1

14 August 2026

Margaret Ann Crigler Park

Jackson, Mississippi

Perkins&Will Project Number: 802119.000

Perkins&Will

1315 Peachtree Street NE, Atlanta, GA 30309 | 404.873.2300

DOCUMENT 00 01 07

PROFESSIONAL SEALS PAGE

The following Documents and Specification Sections have been prepared by or under the direct supervision of the Architect:

ARCHITECT

Perkins&Will
1315 Peachtree Street NE
Atlanta, GA 30309
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DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07 72 00 Roof Accessories

DIVISION 09 – FINISHES

09 29 00 Gypsum Board
09 30 00 Tiling
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10 43 13 Emergency Aid Specialties

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END OF DOCUMENT

Margaret Ann Crigler Park
Jackson, Mississippi
Addendum 1

Perkins & Will, PLLC, d/b/a Perkins&Will
Allen Pratt, Landscape Architect
802119.000
14 August 2026

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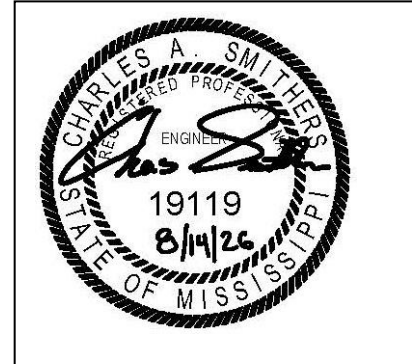
The following Specification Sections have been prepared by or under the direct supervision of the Structural Engineer:

STRUCTURAL ENGINEER

SMITHERS ENGINEERS + CONSULTANTS, LLC
3100 OLD CANTON ROAD, SUITE 201
JACKSON, MS 39216
769-216-3004

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ADDENDUM 1

PART 1 - GENERAL

1.1 SCOPE

- A. This Addendum is issued pursuant to Article 1.1.1 of the AIA General Conditions of the Contract for Construction (A201) in connection with revision of plans and specifications which have been previously issued.
- B. When construction is not under contract, all instructions contained herein shall be reflected in the contract sum and this Addendum will be made a part of the Contract Documents, if, as, and when a Contract is awarded.
- C. This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated **24 July 2026** and Addendum(a) no.(s) **N/A** dated **N/A**, as noted below. **Receipt of this Addendum must be acknowledged in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.**
- D. This Addendum consists of 95 page(s), N/A supplemental drawing(s), and N/A drawing(s).

1.2 CHANGES TO THE PRIOR ADDENDA

- A. N/A

1.3 CHANGES TO THE BIDDING REQUIREMENTS

- A. N/A

1.4 CHANGES TO THE CONDITIONS OF THE CONTRACT

- A. Add the following new Addenda dated **14 August 2026** to the Project Manual:
 - 1. 00 91 13.01 - Addendum 1

1.5 CHANGES TO THE PROJECT SPECIFICATIONS

- A. Replace the following Sections with Revised Sections dated **14 August 2026**:
 - 1. 01 23 00 - Alternates
 - 2. 07 72 00 - Roof Accessories
 - 3. 09 29 00 - Gypsum Board
 - 4. 09 30 00 - Tiling
 - 5. 09 96 00 - High-Performance Coatings

6. 10 41 16 – Emergency Key Cabinet
 7. 10 43 13 – Emergency Aid Specialties
 8. 11 31 00 - Appliances
 9. 13 31 00 – ETFE Tensile Membrane System
- B. Add the following new Sections dated **14 August 2026** to the Project Manual:
1. 13 31 00.13 – PTFE Tensile Membrane System
- C. Delete the following Sections from the Project Manual:
1. 04 22 00 – Concrete Unit Masonry
- 1.6 CHANGES TO THE PROJECT DRAWINGS
- A. Replace the following Drawings with Revised Drawings dated N/A:
- B. Add the following new Drawings dated N/A:
- 1.7 CLARIFICATIONS AND CONTRACTOR QUESTIONS
- A. Question: N/A
1. Response: N/A
- B. Question: N/A
1. Response: N/A

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for alternates.

1.2 DEFINITIONS

- A. Alternate: Amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. Cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Acceptance of Alternates: Alternates will be reviewed and accepted or rejected at Owner's option. Execute accepted alternates under the same conditions as other work of the Contract.
 - 1. Owner Review Time: Provide 30 days for Owner review and decision of acceptance or rejection of Alternates.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1 01 – Bid Alternate 01

1. Base Bid: Full build out of all features as indicated on drawings..
 - a. Bandshell Area: Construct the bandshell structure, stage, associated paving, planting, and related site improvements.
 - b. Play Area: Provide the play structure with slide, climbing wall, stacked boulders, climbing logs, safety surfacing, and associated site improvements.
 - c. Concessions Pavilion and Plaza: Construct the concessions pavilion, paved plaza, and associated site improvements.
 - d. Water Feature Area: Construct the water feature, associated precast concrete seat wall, paving, and related site improvements.
 - e. General Site Improvements: Provide retaining walls, stairs, benches, trash receptacles, site lighting, irrigation, fencing, gates, statue base, and installation of the Owner-furnished statue.
 - f. Landscape Improvements: Construct the event lawn and all designated planting areas, including trees, shrubs, ornamental grasses, perennials, and groundcover.
 - g. Site and Utility Work: Provide all required grading, earthwork, drainage, water, sanitary sewer, electrical, and related utility components.
 - h. Right-of-Way Repairs: Provide patching and restoration within the street right-of-way, including sidewalk, curb, asphalt pavement, and other surfaces disturbed by new site utility connections.
 - i. Cell Tower Enclosure: Demolish and remove the existing cell tower enclosure and construct a new enclosure, including fencing, gates, screening, and foundations.
2. Deduct Alternate: Reduced build out of features outlined below and as indicated on drawings..
 - a. Bandshell Area: Provide decomposed granite surfacing in lieu of the bandshell structure, stage, in-grade lighting, and associated planting.
 - b. Play Area: Provide a planted berm with stone steppers, log stairs, and engineered wood fiber surfacing in lieu of the play structure and slide.
 - c. Pavilion Area: Provide a planted landscape area with stone pavers in lieu of the plaza and concessions pavilion.
 - d. Water Feature Area: Provide lawn in lieu of the splash pad, stone pavers, in-grade lighting, and associated precast concrete seat wall.
3. References:
 - a. Drawing Sheets:
 - 1) Refer to L01 series for base site plan.
 - 2) Refer to BA1-L01 series for Alternate 01 site plan.
 - 3) A00 series - A30 series.

Margaret Ann Crigler Park
Jackson, Mississippi
Addendum 1

Perkins & Will, PLLC, d/b/a Perkins&Will
Allen Pratt, Landscape Architect
802119.000
14 August 2026

- b. Specification: Scope as scheduled on drawings.
- B. Alternate No. 02 – Band ~~s~~Shell Tensile mMaterial
- 1. Base Bid: ETFE membrane system and its supporting steel and/or cable structureassembly.
 - 2. Alternate: PTFE membrane system and its supporting steel and/or cable structureassembly.
 - 3. References:
 - a. Drawing: Sheets ~~A00-series—A30-series.~~ A11-01, A20-02.
 - b. Specifications: ~~Division 13—"Special Construction"~~ 13 31 00 - ETFE Tensile Membrane System, 13 31 00.13 - PTFE Tensile Membrane System.

END OF SECTION

SECTION 04 20 00

LOAD-BEARING CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Lintels.
- F. Accessories.

1.2 RELATED REQUIREMENTS

- A. 07 27 26 – Fluid-Applied Membrane Air Barriers
- B. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.
- F. ASTM C91/C91M - Standard Specification for Masonry Cement; 2023.
- G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.
- H. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.
- I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- K. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- L. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.

- M. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- N. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- O. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.4 ADMINISTRATIVE REQUIREMENTS

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

1.5 SUBMITTALS

- A. See Section 01 33 00 – Submittal Procedures administrative requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, masonry accessories, flashings, mortar, grout mixes. Include description of type and proportions of ingredients and integral water repellant admixture.
- C. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- D. Informational Submittals:
 - 1. Qualification Data: For testing agency.
 - 2. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
 - 3. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - a. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air contents.
 - b. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
 - 4. 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 TMS 602/ACI 530.1/ASCE 6.
 - 5. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
 - 1. Maintain one copy of each document on project site.

1.7 MOCK-UPS

- A. Construct a masonry wall as a mock-up panel sized a minimum of 8 feet long by 6 feet high; include mortar, accessories, structural backup, reinforcement, wall openings, and flashings (with lap joint, corner, and end dam) in mock-up.
- B. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Protects accepted mockups from the elements with weather-resistant membrane.
 - 3. Approval of mockups is for texture and blending of masonry units; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- E. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- F. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD 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 (600 mm) down both sides of walls and hold cover securely in place.
- B. 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 TMS 602/ACI 530.1/ASCE 6.
 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - a. Nominal depths if not indicated on the drawings shall include, but not necessarily be limited to 4, 6, 8, or 12-inches.
 2. Load-Bearing Units: ASTM C90, lightweight.
 - a. Hollow block, as indicated.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- C. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
 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 according to ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) BASF Corporations; Construction Systems; MasterPel.
 - 2) Euclid Chemical Company (The); an RPM company; Eucon Bloctite.
 - 3) GCP Applied Technologies Inc. (formerly Grace Construction Products); Dry-Block.

2.2 MASONRY LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, 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.

2.3 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M, Type N.
 - 1. Colored Mortar: Premixed cement as required to match Architect's color sample.
- B. Mortar Aggregate: ASTM C144.
- C. Grout Aggregate: ASTM C404.
- D. Water: Clean and potable.
- E. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
 - 1. Use in all architectural masonry units mortar.
 - 2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
 - 3. Meet or exceed performance specified for water repellent admixture used in masonry units.
 - 4. Manufacturers:
 - a. Grace Construction Products, a unit of W. R. Grace & Com.; Product: Dry-block Mortar Additive.
 - b. BASF Corporation; Construction Systems; Rheopel Plus Mortar Admixture.
 - c. Euclid Chemical Company (The); and RPM company; Blocktite Mortar.
- F. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Type: Type N.
 - 2. Color: as indicated.
 - 3. Manufacturers:
 - a. Ash Grove Packaging.
 - b. Cemex.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 REINFORCEMENT AND ANCHORAGE

- A. As a "Standard of Quality". the products for reinforcement and anchorage are based on the products of Hohmann & Barnard, unless noted otherwise.
- B. Manufacturers:

1. The following manufacturers are acceptable after compliance with the requirements of this section:
 2. Hohmann & Barnard, Inc: www.h-b.com/sle.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Reinforcing Steel: ASTM A615/A615M, Grade 60 - 60,000 psi, deformed billet bars; uncoated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Ladder.
 2. Hohmann & Barnard; Product: 220 Ladder-Mesh. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to 16 CFR 1201 Class B.
 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

2.5 FLASHINGS

- A. Flexible Flashing: Use the following unless otherwise indicated:
1. Stainless Steel Core Flexible Flashing: Engineered system, with high resistance to damage, composite sheet with a stainless steel core, non-asphalt adhesive polymer fabric laminated to one face of sheet.
 - a. Stainless steel: ASTM A240/A240M, Type 304, 0.011 inch (0.28 mm) thick.
 - b. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - 1) York Manufacturing, Inc.; Multi-Flash SS.
 - 2) STS Coatings, Inc.; Gorilla Flash Stainless Fabric.
 - 3) Hohmann & Barnard: Might-Flash.
 - c. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 - d. Use only where flashing is fully concealed in masonry.
- B. Rubberized Asphalt Flashing: Self-adhering composite material comprising rubberized asphalt adhesive compound bonded to cross-laminated polyethylene film, minimum 0.040 inch total thickness. Provide Textroflash manufactured by Hohmann & Barnard, Inc.
1. Flashing Accessories: Priming; prep with Textroflash Primer and Textroflash Mastic for concrete, masonry and some exterior gypsum substrates.
 2. Termination Bar; T2-FTS as manufactured by Hohmann & Barnard, Inc. with factory installed foam strip and 3/8 inch flange for sealant.
 - a. Seal the top of all flashing termination bars with manufacturers recommended sealant. Sealant shall adhere and be comparable with weather barrier or dampproofing substrate.

- C. Corners and End Dams: Welded Stainless Steel End Dams, at all inside corners, outside corners and end dams; ASTM A 240, ASTM A 666, 480, ASTM A167.
 - 1. Type 18 gauge 304 stainless steel.
 - 2. Welded to ensure seal at joints.
 - 3. Location: All end dams and inside and outside corners under rubberized asphalt flashing.
- D. Membrane Underlayment: See Section 07 62 00 (coping, planters, parapets, etc.) as indicated.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.6 ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
- B. Preformed Control Joints: PVC material for single-wythe concrete masonry walls.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc (including Dur-O-Wal brand); RS Series: www.h-b.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Joint Filler: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; 1/4 to 6 (as required) inch wide x by maximum lengths available.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc (including Dur -O-Wal brand); Standard Backer Rod: www.h-b.com.
 - b. WIRE-BOND: www.wirebond.com/#sle.
- D. Exterior Control Joint Sealant:
 - 1. Use nonsag non-staining silicone sealant; see Section 07 92 00.
 - 2. Sealant Back-up - Round bars of Ethafoam, Polycell, or approved equivalent compatible with sealant.
 - a. Bond Breaker Tape - As recommended by sealant manufacturer.

2.7 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Unless indicated otherwise on the structural drawings the following shall apply to the project;
 - 2. Masonry below grade and in contact with earth: Type S.
 - 3. Exterior, loadbearing masonry: Type N.
 - 4. Interior, loadbearing masonry: Type N.

- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - 1. Grout Mix Designs:
 - a. Bond Beams, Lintels, and Block Filled Cells: 3000 psi strength at 28 days; 8-10 inches slump; mix in accordance with ASTM C476.
 - 1) Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
 - 2) Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- C. Masonry and mortar shall be covered from rain and weather and stored off ground on pallets.
- D. Sand shall be clean and stored in debris free area.
- E. Package tag shall be on each pallet.

3.3 COLD AND HOT WEATHER REQUIREMENTS

- A. Cold Weather Construction: The following construction requirements shall apply to work in progress and shall be based on ambient temperature.
 - 1. Temperatures between 40 degrees F and 32 degrees F:
 - a. Water and aggregates used in mortar and grout shall not be heated above 140 degrees F.
 - b. Mortar sand or mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F at the time of mixing.
 - c. Heat water and aggregates for grout materials when their temperature is below 32 degrees F.

- d. Protection Requirements.
 - 1) Completely cover newly constructed masonry with a weather-resistive membrane for 24 hrs after construction.
2. Temperatures between 32 degrees F and 25 degrees F:
 - a. The requirements for temperatures between 40 degrees F and 32 degrees F (as specified above) shall be met; and the following construction requirements:
 - 1) Maintain mortar temperature above freezing until used in masonry.
 - 2) Aggregates and mixing water for grout shall be heated to temperatures between 70 degrees F and 120 degrees F at the time of mixing. Grout temperature shall be maintained above 70 degrees F at the time of grout placement.
 - b. Protection Requirements.
 - 1) Completely cover newly constructed masonry with a weather-resistive membrane for 24 hrs after construction.
3. Temperatures between 25 degrees F and 20 degrees F:
 - a. The requirements for temperatures between 40 degrees F and 32 degrees F and the requirements for temperatures between 32 degrees F and 25 degrees F (as specified above) shall be met; and the following construction requirements:
 - 1) Masonry surfaces under construction shall be heated to 40 degrees F.
 - 2) Wind Breaks or enclosures shall be provided when wind velocity exceeds 15 miles per hour (mph).
 - 3) Prior to grouting, masonry shall be heated to a minimum of 40 degrees F.
 - b. Protection Requirements.
 - 1) Completely cover newly constructed masonry with a weather-resistive membrane for 24 hrs after construction.
4. Extend the time period to 48 hrs for grouted masonry, unless the only cement in the grout is Type III portland cement. Temperatures at or below 20 degrees F:
 - a. Masonry units shall not be laid when the temperature is 20 degrees F or below.
- B. Hot Weather Construction: The following construction requirements shall apply to work in progress and shall be based on ambient temperature.
 1. Temperatures exceed 100 degrees F or exceed 90 degrees with a wind velocity greater than 8 mph.
 - a. The temperature of mortar and grout shall be maintained below 120 degrees F.
 - b. Mixers, mortar transport containers and mortar boards shall be flushed with cool water before they come into contact with mortar ingredients or mortar.
 - c. Mortar consistency shall be maintained by re-tempering with cool water.
 - d. Use mortar within 2 hours of mixing.
 2. When ambient temperature exceeds 115 degrees or 105 degrees with a wind velocity greater than 8 mph, the requirements for temperatures exceeding 100 degrees F or exceeding 90 degrees with a wind velocity greater than 8 mph (as

specified above) shall be implemented; and materials and mixing equipment shall be shaded from direct sunlight.

3.4 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 and conform to 8-inch module both horizontal and vertical.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.5 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use sand-blasting or high pressure cleaning methods.
- F. Interlock intersections and external corners.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- J. Fill space between steel frames and masonry with sound attenuation mineral wool-insulation unless otherwise indicated.
- K. 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 mortar or grout into core.
- L. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.6 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

- B. Weeps shall always be installed above grade or sidewalks at least one course. Contractor shall coordinate the installation of weeps so that weeps are not installed below adjacent sidewalks or grade.

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

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6-3/4 (for 9 gauge side rods) and 8-1/2 (for 3/16) inches.

3.8 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Provide end dam and corner flashings at door and window heads, sills, masonry transitions, masonry corners and other locations indicated. Lap end dams with flashings.
 - a. All masonry flashings are to be supported in the cavity wall, whether or not indicated in the drawings. The Contractor shall provide treated wood blocking (cut and sloped to exterior) the full depth of the masonry cavity under flashing for proper support with a positive slope to the exterior and to prevent sag and entrapment of water in the wall.
 - 1) Fabricated end dam to match slope of treated wood blocking.
 - b. Provide 18 gauge stainless steel inside and outside corners and end dams under flashing.
 - c. Provide intermediate end dams, back to back, in long flashing runs at spacing not to exceed 30' OC or to masonry control joints (typical @ 30' OC). Do not span masonry control joints with end dams.
 - 2. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
 - 3. Extend flashings at window head and sills 8 inches past jambs and provide termination bar at top of flashing at the window head.
 - 4. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 5. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing:
- C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.
- D. Seal the top of all masonry flashing termination bars with manufacturers recommended sealant.

- E. Flashing at sloped grades shall be stair-stepped and sealed.
- F. Provide water stops at all construction joints at or below grade.
- G. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with up-turned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Attached web covers will span from pan to pan providing protection over the web and the joints of the CMU.

3.9 LINTELS

- A. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled. See structural drawings for requirements.

3.10 GROUTED COMPONENTS

- A. Lap splices per structural drawings.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.
- D. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.
- E. Perform all grouting by means of high-lift technique.
 - 1. Do not use high-lift grouting where size of cavities mandates use of fine grout.
 - 2. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
 - 3. Hollow Masonry: Limit lifts to maximum 4 feet height.
 - 4. Place grout for spanning elements in single, continuous pours.
- F. Provide grouted masonry cores and reinforcing at corners, intersections, jambs, etc. as indicated on structural drawings.

3.11 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Install control joints typically within 10' of a corner and within 30' maximum spacing unless indicated on the drawings.
- D. Prior to performance of sealing, a sample of sealant color and application must be provided for acceptance by the Architect. Work shall proceed only after Architect's approval of test application.
- E. Comply with sealant manufacturer's printed instructions except where more stringent requirements are specified herein.
- F. Install backings are to comply with, but are not limited to, the following requirements:

1. Install joint fillers of type indicated to provide support of sealant during application and at position required to produce the cross-sectional shapes and depths of installed sealant relative to joint widths which allow optimum sealant movement capability.
2. Do not leave gaps between ends of joint-fillers.
3. Do not stretch, twist, puncture or tear joint fillers.
4. Install bond breaker tape between sealants and joint fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.
 - a. Install joint fillers of type indicated to provide support of sealant during application and at position required to produce the cross-sectional shapes and depths of installed sealant relative to joint widths which allow optimum sealant movement capability.
 - b. Do not leave gaps between ends of joint-fillers.
 - c. Do not stretch, twist, puncture or tear joint fillers.
 - d. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.
 - e. Install bond breaker tape between sealants and joint fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.
5. Install sealant by proven techniques that result in sealant directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
6. Tooling of Nonsag Sealant - Immediately after sealant application and prior to time skinning or curing begins, tool sealant to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess material from surfaces adjacent to joint. Do not use tooling agents which discolor sealant or adjacent surfaces or are not approved by manufacturer. Concave joint configuration as required by the Drawings and approval of the Architect.
7. Employ only proven installation techniques which shall ensure that sealant shall be deposited in uniform, continuous ribbons without gaps or air pockets.
8. Fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surfaces and a vertical surface, fill joint to form a slight cove, so that joint shall not trap moisture and dirt.
9. For normal joints sealed with sealants and not subject to traffic, fill joints to a depth equal to 50% of joint width, but not more than 1/2" deep or less than 1/4" deep.
10. Where necessary, use masking tape to avoid overflow onto adjoining surfaces or migration into the voids of rough textured surfaces.
11. Remove excess and spillage of compounds promptly as the work progresses. Clean the adjoining surfaces to eliminate evidence of spillage.
12. Cure sealant compounds in compliance with manufacturer's recommendations

and warranty to obtain high early bond strength, internal cohesive strength and surface durability.

3.12 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Where electrical pipes, conduit or mechanical/plumbing pipes are in the exterior masonry cavity walls, the contractor shall locate these in the concrete masonry unit (CMU) cores. Placement on the exterior side of the CMU in the air space is not acceptable.

3.13 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.14 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, and conduit. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.
- C. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.16 REPAIRING

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged or if units do not match adjoining units as intended. Provide new units to match units and install with fresh mortar or grout, pointed to eliminate evidence or replacement.

- 1. Protect the base of the wall from mud splashes and mortar droppings.

3.17 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution per manufacturer's instructions.
- D. Allow to remain on wall usually 3-5 minutes.
- E. Spray wash off wall and thoroughly rinse.
- F. Use non-metallic tools in cleaning operations.

3.18 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- B. Protect the top of concrete masonry walls from moisture and water penetration.

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof curbs.
- B. Roof hatches.

1.2 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: For each type of roof accessory.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Shop Drawings: For roof accessories.
 - a. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
 - 3. Delegated-Design Submittal: For roof curbs indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - a. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
 - b. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
- B. Informational Submittals:
 - 1. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - a. Size and location of roof accessories specified in this Section.

- b. Method of attaching roof accessories to roof or building structure.
 - c. Other roof-mounted items including mechanical and electrical equipment, piping, and conduit.
 - d. Required clearances.
- 2. Sample Warranties: For manufacturer's special warranties.
- C. Closeout Submittals:
 - 1. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 - Quality Requirements to design roof curbs to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Manufacturers:
 - a. AES Industries, Inc.
 - b. Air Balance Inc.; a division of MESTEK, Inc.
 - c. Bristolite Daylighting Systems, Inc.
 - d. Curbs Plus, Inc.
 - e. Custom Solution Roof and Metal Products.
 - f. Greenheck Fan Corporation.
 - g. KCC International Inc.
 - h. Lloyd Industries, Inc.
 - i. LMCurbs.
 - j. Metallic Products Corp.
 - k. Milcor; Commercial Products Group of Hart & Cooley, Inc.

- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Unless otherwise indicated or required for strength, fabricate units from minimum 0.0747-inch-(1.9-mm-) thick, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 - 1. Finish: Mill phosphatized.
- D. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 - 3. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
 - 4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
 - 5. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
 - 6. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 - 7. Nailer: Factory-installed wood nailer along top flange of curb under top flange on side of curb, continuous around curb perimeter.
 - 8. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
 - 9. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch (19-mm) thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 - 10. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Manufacturers:
 - a. Acudor Products, Inc.
 - b. ~~AES Industries, Inc.~~
 - c. Babcock-Davis.
 - d. Bilco Company (The).
 - e. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - f. Milcor; Commercial Products Group of Hart & Cooley, Inc.
- B. Type and Size: Single-leaf lid:

ROOF ACCESSORIES

1. Size: 30 by 30 inches (762 by 762 mm).
 2. Basis of Design Product: Acudor ~~Products, Inc.~~ RHA3030T Aluminum, 30 x 30 Ladder Access Roof Hatch.
- C. Loads: Minimum 40-lbf/sq. ft. (1.9-kPa) external live load and 20-lbf/sq. ft. (0.95-kPa) internal uplift load.
- D. Hatch Material: Aluminum sheet with stainless steel hardware.
1. Thickness: Manufacturer's standard thickness for hatch size indicated.
 2. Finish: Mill finish.
- E. Construction: Thermally broken.
1. Insulation: Glass-fiber board or polyisocyanurate board.
 - a. R-Value: 18.0 according to ASTM C 1363.
 2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 4. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
 5. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
- F. Hardware: Spring operators, hold-open arm, galvanized-steel spring latch with turn handles, galvanized-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
1. Provide two-point latch on lids larger than 84 inches (2130 mm).
- G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Manufacturers:
 - a. Acudor Products, Inc.
 - b. Babcock-Davis.
 - c. Bilco Company (The).
 - d. Edge Fall Protection.
 - e. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - f. SafePro Safety Products
 2. Height: 42 inches (1060 mm) above finished roof deck.
 3. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches (31 mm) in diameter or galvanized-steel tube, 1-5/8 inches (41 mm) in diameter.
 4. Flat Bar: Galvanized steel, 2 inches (50 mm) high by 3/8 inch (9 mm) thick.
 5. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches (533 mm) in diameter.
 6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.

7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
9. Fabricate joints exposed to weather to be watertight.
10. Fasteners: Manufacturer's standard, finished to match railing system.
11. Finish: ~~Manufacturer's standard.~~ Powder coat paint finish.
 - a. Color: Matching finish and color of Pavilion Canopy/Trellis.
12. Basis of Design: ~~Roof Hatch Fall Protection Safety Rail Model No. SPRHSR~~ Safety Rails, size as required by Acudor Products, Inc. to accommodate roof hatch. ~~SafePro L.P., 877-723-357.~~

2.4 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation and mill phosphatized for field painting where indicated.
 1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.
 1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- C. Steel Tube: ASTM A 500/A 500M, round tube.
- D. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
- E. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.5 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.
- C. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.

- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Underlayment:
 - 1. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
- F. Fasteners:
 - 1. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 2. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
- G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- H. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- J. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

2.6 GENERAL FINISH REQUIREMENTS

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

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Roof-Hatch Installation:
 - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 2. Attach safety railing system to roof-hatch curb.
- E. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

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Addendum 1

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802119.000
14 August 2026

- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 96 00 - High-Performance Coatings.
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior gypsum board.
- B. Tile backing panels.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Submit manufacturer's technical data for each type of gypsum board product, including related accessories. Furnish a material list with technical data documenting the location and primary function, quality, and performance of each material component or system to be used in the Work, or other such primary characteristics as required by the Drawings or Specifications.
 - a. Submit manufacturer's technical data for each gypsum drywall partition and each ceiling system.
 - 2. Shop Drawings: Show locations, fabrication, and installation of control joints including plans, elevations, sections, details of components, and attachments to other units of Work.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS

2.1 GYPSUM BOARD, GENERAL

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

2.2 INTERIOR GYPSUM BOARD

- A. Manufacturers:
 1. American Gypsum.
 2. CertainTeed Corporation.
 3. Georgia-Pacific Building Products.
 4. National Gypsum Company.
 5. USG (EcoSmart gypsum board products are acceptable).
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
 1. Thickness: 5/8 inch (15.9 mm).
 2. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C1396/C1396M.
 1. Thickness: 1/2 inch (12.7 mm).
 2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
 1. Manufacturers:
 - a. CertainTeed Corp.; Diamondback GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
 - c. National Gypsum; eXP Tile Backer.
 - d. USG Corporation; Durock Glass-Mat Tile Backer Boards.
 2. Core: 5/8 inch (15.9 mm), Type X.
 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
 1. Manufacturers:
 - a. C-Cure; C-Cure Board 990.
 - b. CertainTeed Corp.; FiberCement BackerBoard.
 - c. James Hardie Building Products, Inc.; Hardiebacker 500.
 - d. National Gypsum Company, PermaBase Cement Board.
 - e. USG Corporation; DUROCK Cement Board.

2. Thickness: 5/8 inch (15.9 mm).
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. L-Bead: L-shaped; exposed long flange receives joint compound.
 - c. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- D. Joint Compound for Tile Backing Panels:
 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Moisture Barrier Membrane:
 1. Material Quality Standard: ANSI A108 Series, A-2.1.8.
 2. Acceptable Products:
 - a. Reinforced Asphalt Paper: ASTM C171, duplex type.
 - b. Polyethylene Vapor Retarder: ASTM D4397, 4 mils thick, 0.19 maximum permeance rating.
 3. Tape: Moisture resistant, pressure sensitive tape suitable for sealing membrane to plumbing pipes penetrating wallboard.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
1. Type X: Vertical surfaces unless otherwise indicated.
 2. Ceiling Type: Ceiling surfaces, except at fire rated ceilings, then use Type X.
 3. Tile Backer-Glass-Mat Type:
 - a. Tiled walls in restrooms.
 4. Cementitious Backer Type:
 - a. At the following locations:
 - 1) Exterior walls of tiled walls in restrooms.
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLATION OF GYPSUM PANELS FOR CEILINGS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.

3.5 INSTALLATION OF TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
 - 1. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.
- B. Cementitious Backer Units: ANSI A108.11.
 - 1. Moisture Barrier Membrane: Install membrane over area to be covered with cementitious wallboards.
 - a. Use tape to temporarily hold membrane in place until covered with additional wallboards.
 - b. Shingle upper course over lower course.
 - c. Lap not less than 3 inches.
 - d. Where plumbing pipes penetrate membrane, seal membrane to pipe with tape.
 - 2. Backer Units: Install cementitious board vertically.
 - a. Cut as directed by manufacturer without damaging edges. Treat edges per manufacturer's recommendations.
 - b. Anchor with screws, spaced according to fastening sequence as recommended by manufacturer.
 - c. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect, unless otherwise indicated.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. L-Bead: Use where indicated.

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 3: Mechanical Rooms, Electrical Rooms, and similar spaces.
 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 - Interior Painting.
 5. Level 5:
 - a. At exposed locations utilizing glass mat interior gypsum board products and where required by another specification Section as preparation of wall.
 - b. At all exposed drywall surfaces within main entrance hallways, and areas scheduled to receive accent lighting or semi-gloss finishes, refer to room finish schedules for locations.
 - c. Where indicated on Drawings.
 - d. Primer and its application to surfaces are specified in Section 09 91 23 - Interior Painting.
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before installing gypsum board ceilings, conduct an above-ceiling inspection, and report and correct deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
- B. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for Contractor's above-ceiling inspection. Provide Architect with copy of deficiencies report.
1. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of ceiling support framing.
 - g. Installation of seismic restraints (sway bracing and compression struts).

3.9 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 30 00

TILING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Tiling of composition as follows:
 - 1. Ceramic Tile.
- B. Tiling in locations as follows:
 - 1. Interior Wall Tile.
- C. Tiling accessories:
 - 1. Wall Edge Protection Metal Strips.

1.2 RELATED REQUIREMENTS

- A. Related Section Requirements:
 - 1. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Division 9 Section "Gypsum Board" for glass-mat, water-resistant backer board.
 - 3. Division 10 Section "Toilet and Bath Accessories" for toilet accessories mounted in tile work.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 SUBMITTALS

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

2. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
 3. Samples for Initial Selection: For each type of tile and grout not fully selected. Include Samples of accessories involving color selection.
 4. Samples for Verification:
 - a. Full-size units of each type and composition of tile and for each color and finish required.
 - b. Assembled samples with grouted joints for each type of tile and for each finish required, at least 36 inches (900 mm) square and mounted on a rigid panel. Use grout of type and in color(s) approved for completed Work.
 - c. Range Samples consisting of at least four full-size units of each type of tile, exhibiting extremes of the full range of color and other visual characteristics expected. Range Samples establish the standard by which individual tiles will be judged.
 - d. Full-size units of each type of trim and accessory for each color and finish required.
 - e. Metal edge strips in 6-inch (150-mm) lengths.
- B. Informational Submittals:
1. Qualification Data: For qualified Installer.
 2. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
 3. Product Certificates: For each type of product, signed by product manufacturer.
 4. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.5 QUALITY ASSURANCE

- A. Provide material and installation complying with following:
1. Tile Council of North America Inc. (TCNA):
 - a. Handbook for Ceramic Tile Installation, current edition.
 2. American National Standards Institute Specifications for:
 - a. Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile Installed with Portland Cement Mortar, A108.1:
 - 1) Dry-Set Portland Cement Mortar, A118.1
 - 2) Latex-Portland Cement Mortar, A118.4
 - 3) Grout, A118.6 and A108.10
 - 4) Epoxy Mortar and Grout, A108.6 & A118.8
 - 5) Organic Adhesive for Installation of Ceramic Tile, A 136.1
 - 6) [Cementitious Backer Boards, A118.9](#)
 - 7) Recommended Standard Specifications for Ceramic Tile, A137.1

- B. Installer Qualifications: Engage an experienced installer having a minimum of 5 years experience on projects of comparable size and scope who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
 - C. Supplier Qualifications: A firm experienced in supplying products similar to those indicated for the Project and with a record of successful in-service performance.
 - D. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
 - E. Source Limitations for Setting and Grouting Materials: Installation System Manufacturer / Company specializing in adhesives, mortars, grouts and other installation materials with ten (10) years minimum experience and ISO 9001 certification. Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
 - 1. Source Limitations: For each tile installation, obtain compatible formulations of setting and grouting materials containing latex or latex additives from a single manufacturer.
 - F. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Joint sealants.
 - 2. Metal edge strips.
 - G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of wall tile installation. Ensure lighting is fully functional at the time of Architect's mockup review.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - H. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
 - B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
 - 1. Maintain ambient temperatures not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C) during installation and for a minimum of seven (7) days after completion.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence tile installation with other work to minimize possibility of damage and soiling during remainder of construction period.
- B. Install tile and accessories only after other finishing operations, including painting, have been completed.

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated in unopened packages.

1.10 WARRANTY

- A. Installation System Manufacturer of adhesives, mortars, grouts and other installation materials shall provide a written warranty covering materials and labor.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
 - 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. Basis of Design Products:
 - 1. As scheduled in the Drawings.

2.3 WALL EDGE PROTECTION METAL STRIPS

- A. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Blanke Corporation.
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P.
 - 2. Basis of Design Manufacturer: Schluter Systems.

- a. Profiles:
 - 1) Outside Corner Edge Protection, Tile-to-Tile: Jolly.
 - 2) Finishing Edge Protection, Tile-to-CMU: Jolly.
 - 3) Finishing Edge Protection, Tile-to-Resinous Flooring Base: Schiene.

2.4 SETTING MATERIALS

- A. Modified Dry-Set Cement Mortar (Thinset): ANSI A118.4 and ISO 13007; C2.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Wall Applications, large format tile:
 - 1) X77 (Ardex).
 - 2) ProLite (Custom Building Products).
 - 3) Laticrete; 255 MultiMax (Laticrete).
 - 4) Ultralite Pro (Mapei).
 - 5) 3N1 Performance Mortar (TEC).
 - 2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4 and ISO 13007; C2T.

2.5 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3 and ISO 13007; RG, with a VOC content of 65 g/L or less.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. WA 100% Solids Epoxy (Ardex).
 - b. 100% Solids Epoxy or Fusion (Custom Building Products).
 - c. SpectraLOCK Pro Premium (Laticrete).
 - d. Kerapoxy CQ or Flexcolor CQ (Mapei).
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F (60 and 100 deg C), respectively, and certified by manufacturer for intended use.

2.6 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants".
 - 1. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning 786 (Dow)
 - b. Sanitary 1700 (GE Silicones).
 - c. Latasil Tile & Stone Sealant (Laticrete).
 - d. Pecora 898 Sanitary Silicone Sealant (Pecora).
 - e. Tremco Incorporated; Tremsil 600 White (Tremco)

2.7 MISCELLANEOUS MATERIALS

- A. Temporary Protective Coating at Tiles: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- B. Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile producers and grout manufacturers.
 - 1. Basis of Design Products, Laticrete, "Stonetech Professional Stone & Tile Cleaner".

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that water resistant gypsum wallboard and tile backer board is installed and prepared in accordance with Gypsum Association GA 216-75.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- B. Lay out tile patterns by marking joint lines on substrates to verify joint placement at edges, corners, doors, and other critical elements.
 - 1. Notify Architect seven days in advance of dates and times when layout will be done.
 - 2. Obtain Architect's approval of layout before starting tile installation.
- C. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. Follow procedures in the ANSI A108 Series of tile installation standards for tile layout including but not limited to:
 - a. Center and balance areas.
 - b. Excess amount of cuts.
 - c. Smooth edge cuts.
- B. Wipe backs of tiles with a damp cloth to remove dirt and dust before units are installed.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
 1. Finish cut tile edges that will not be concealed by other construction by grinding and honing cut surfaces and beveling edges to match factory-fabricated edges unless otherwise indicated.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 2. Where adjoining tiles on walls or trim are specified or indicated to be same size, align joints.
 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on walls or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 1. 1/16-inch unless otherwise noted in Tiling Schedule.
 2. Align joints center to center.
- H. At inside corners of tile walls, provide sealant joint. Joint width to match specified joint widths. Color of exposed sealant to match color of grout in tile.
- I. Tile Layout:
 1. Match tiles within each space by selecting tiles to achieve uniformity of color and pattern. Reject or relocate tiles that do not match color and pattern of adjacent tiles.
 2. Mix tiles to achieve a uniformly random distribution of color shadings and patterns.

3. Pattern Orientation: For tile varieties with directional pattern, orient pattern as indicated or as directed by Architect.
- J. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 1. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.4 INSTALLATION TOLERANCES OF TILEWORK

- A. Variation from Plumb: For vertical joints, external corners, and other conspicuous lines, do not exceed 1/8 inch in 8 feet (3 mm in 2.4 m).
- B. Variation in Level: For horizontal joints and other conspicuous lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m), or 1/2 inch (12 mm) maximum.
- C. Variation in Plane between Adjacent Units (Lipping): Do not exceed the following differences between faces of adjacent units as measured from a straightedge parallel to tiled surface:
 1. Units with Polished Faces: 1/64 inch (0.4 mm).
 2. Units with Honed Faces: 1/64 inch (0.4 mm).
 3. Units with Sand-Rubbed Faces: 1/32 inch (0.8 mm).
 4. Units with Thermal-Finished Faces: Depth of thermal finish or 3/16 inch (5 mm), whichever is less.
 5. Units with Natural-Cleft Faces: Depth of natural-cleft finish or 3/16 inch (5 mm), whichever is less.
- D. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch (1.6 mm) or one-fourth of nominal joint width, whichever is less.
- E. Hand-Tight Joints: Do not exceed 1/64 inch (0.4 mm).

3.5 CLEANING

- A. Remove and replace material that is stained or otherwise damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove latex-portland cement grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
 - a. Do not remove floor sealer if used as protective coating.

3.6 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations, Metal Studs or Furring:
 1. Ceramic Tile Installation W243: TCNA W243; thinset mortar on gypsum board.
 - a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
 - b. Thinset Mortar:
 - 1) Tile under 14 by 14-inch size: Modified dry-set mortar.
 - 2) Tile over 14 by 14-inch size: Modified dry-set mortar for large format tile.
 - c. Grout: Water-cleanable epoxy.
 - d. Locations: Wall tile over 14 by 14 inches (355 by 355 mm) in size or if one side is over 18-inches (457 mm) long.
 2. Tile Installation W244C: TCNA W244C; thinset mortar on cementitious backer units with vapor retarder membrane.
 - a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
 - b. Thinset Mortar:
 - 1) Tile under 14 by 14-inch size: Modified dry-set mortar.
 - 2) Tile over 14 by 14-inch size: Modified dry-set mortar for large format tile.
 - c. Grout: Water-cleanable epoxy.
 - d. Locations: Wall tile over 14 by 14 inches (355 by 355 mm) in size or if one side is over 18-inches (457 mm) long.

END OF SECTION

SECTION 09 96 00

HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation and application of high-performance coating systems on the following:
- B. Exterior substrates:
 - 1. Steel.
 - 2. Galvanized metal.
- C. Interior Substrates:
 - 1. Concrete Masonry Units (CMU's).
 - 2. Galvanized metal.
 - 3. Gypsum board.
 - 4. Steel doors, frames, and exposed overhead structure, and any exposed steel not otherwise coated.

1.2 DEFINITIONS

- A. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523 (traditional semi-gloss).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: For each type of Paint System, submit product data cut sheets, including preparation requirements and application instructions.
 - a. Formulate product data cut sheets into sets for each Paint System required.
 - 2. Samples for Verification: For each type of paint system and in each color and gloss of finish coat indicated.
 - a. Step coats on Samples to show each coat required for system.
 - b. Label each Sample with Paint System designation.
 - c. Label each Sample for location and application area.
 - d. Dry samples a minimum of 7-days before submitting.
 - e. Submit Samples on the following substrates for the Architect's review of color and texture only:
 - 1) Submit Samples on rigid backing, 8 inches square.

- 2) Ferrous / Galvanized Metal: Provide two 4-inch-(100-mm-) square samples of flat metal and two 8-inch-(200-mm-) long samples of solid metal for each color and finish.
3. Product List: For each product indicated, include the following:
 - a. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - b. VOC content.
- B. Maintenance Material Submittals:
 1. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply coatings when relative humidity exceeds 85 percent. The surface should be dry and at least 5 degrees above the dew point and rising.
- C. Do not apply exterior coatings in snow, rain, fog, or mist. Do not apply interior coatings to damp or wet surfaces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.
- B. Manufacturers: The following manufacturers are referred to in the paint schedules by name:
 - 1. Carboline Company.
 - 2. Pittsburgh Paints Company.
 - 3. Sherwin-Williams Company (The).
 - 4. Tnemec Company, Inc..

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each coating system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
 - 3. Provide products of same manufacturer for each coat in a coating system.
- B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
 - 1. Nonflat Paints and Coatings: 150 g/L.
 - 2. Primers, Sealers, and Undercoaters: 100 g/L.
 - 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
 - 4. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 5. Pre-Treatment Wash Primers: 420 g/L.
- C. Colors: Provide custom colors of the finished paint systems to match the Architect's samples.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (CMUs): 12 percent.

2. Gypsum Board: 12 percent.
- C. Concrete Masonry Units Substrates: Verify fins, ridges, mortar, and other projections have been removed from concrete masonry units and concrete masonry units joints have been tooled and pointed as specified in Section 04 22 00 "Concrete Unit Masonry".
- D. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- E. Steel and Galvanized Metal Substrates: Verify tool and die marks and stretch lines have been removed and blended into surrounding surface and exposed welds and surfaces are finished smooth and blended.
- F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" or more stringent instructions listed below applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed.
 2. Remove surface-applied protection for items left in place due to size or weight.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
 1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings. Clean using methods recommended in writing by coating manufacturer, but not less than the following:
 - 1. SSPC-SP 16 "Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals".

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.
- E. Painting Metals, Plumbing, Electrical, Site Improvements, and Site Utilities:
 - 1. Paint the following work where exposed on the building exterior and site:
 - a. Grate inlets.
 - b. Manhole covers.
 - c. Valve covers.
 - d. Uninsulated metal piping.
 - e. Metal conduit.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Contractor shall touch up and restore coated surfaces damaged by testing.

2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

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

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel, Zinc-Coated (Galvanized and Galvannealed) (Sg) Moderate Environment:
 1. Paint System Sg-P5: Aliphatic Polyurethane Enamel over Epoxy primer, Semi-gloss Finish:
 - a. Carboline:
 - 1) First Coat: Carboguard 60 4.0 to 6.0 mils DFT.
 - 2) Second Coat: Carbothane 133 LV ~~for 133~~ VOC, 3.0 to 5.0 DFT.
 - b. Pittsburgh Paints Company:
 - 1) First Coat: Amercoat 385 2-Component Polyamide Epoxy 3.0 to 8.0 mils DFT.
 - 2) Second Coat: Pitthane Ultra LS 95-901 Series 2.0 to 5.0 DFT.
 - c. Sherwin-Williams Company (The):
 - 1) First Coat: MacroPoxy 646-100 Fast Cure Epoxy, B58-600 Series. 5.0 to 10.0 mils DFT.
 - 2) Second Coat: Hi-Solids Polyurethane 250, B65 Series Semi-Gloss, 2.0-3.0 DFT.
 - d. Tnemec:
 - 1) First Coat: Series N69 Hi-Build Epoxoline II Polyamidoamine Epoxy. 4.0 to 6.0 mils DFT.
 - 2) Second Coat: Series ~~10751095~~ Endura-Shield II 2.0 to ~~53.0~~ DFT.
 2. Paint System Sg-F5: Water-Based Dry-Fall, Semi-gloss Finish:
 - a. Carboline:
 - 1) First Coat: Carbocrylic 3359 ~~—DTMC 2.03.0 - 3.04.0 mils~~ DFT.
 - 2) Second Coat: Carbocrylic 3359 ~~—DTMC 2.03.0 - 3.04.0 mils~~ DFT.
 - b. Pittsburgh Paints Company:
 - 1) First Coat: Pitt-Tech 90-812 Acrylic Dry Fall 2.0 to 4.0 mils DFT.

- 2) Second Coat: Pitt-Tech 90-812 Acrylic Dry Fall 2.0 to 4.0 mils DFT.
 - c. Sherwin Williams:
 - 1) First Coat: Pro Industrial Multi-Surface Acrylic, B66-1550 applied at 1.5 to 2.5 DFT.
 - 2) Second Coat: Pro Industrial Multi-Surface Acrylic, B66-1550 applied at 1.5 to 2.5 DFT.
 - d. Tnemec:
 - 1) First Coat: Series 115 Uni-Bond DF applied at 2.0 to 3.0 DFT
 - 2) Second Coat: Series 1029 Enduratone applied at 2.0 to 3.0 DFT
- B. Steel, Unprimed (Su) Substrates Moderate Environment:
- 1. Paint System Su-P6: Acrylic Aliphatic Polyurethane Enamel over Zinc-Rich or Manufacturer's Recommend Epoxy Primer, Semi-gloss Finish:
 - a. Carboline:
 - 1) First Coat: Carboguard 60 - ~~3.0~~4.0 to 6.0 mils DFT.
 - 2) Second Coat: Carbothane 133 LV ~~for 133~~ VOC, 3.0 to 5.0 mils DFT.
 - b. Pittsburgh Paints Company:
 - 1) First Coat: Amerlock 2/400 Polyamide Epoxy 4.0 to 8.0 mils DFT.
 - 2) Second Coat: Pitthane Ultra LS 95-901 Series 2.0 to 5.0 mils DFT
 - c. Sherwin-Williams Company (The):
 - 1) First Coat: MacroPoxy 646-100 Fast Cure Epoxy, B58-600 Series. 5.0 to 10.0 mils DFT.
 - 2) Second Coat: Hi-Solids Polyurethane 250, B65 Series Semi-Gloss, 2.0-~~to~~ 3.0 mils DFT.
 - d. Tnemec:
 - 1) First Coat: Series N69 Hi-Build Epoxoline II Polyamidoamine Epoxy - 3.0 mils DFT
 - 2) Second Coat: Series ~~1075~~1095 Endura-Shield @ 2.0 to 3.0-4.0 mils DFT.
 - 2. Paint System Su-F5: Water-Based Dry-Fall, Semi-gloss Finish:
 - a. Carboline:
 - 1) First Coat: Carbocrylic 3359 DTMC - 3.0 to 4.0 mils DFT.
 - 2) Second Coat: Carbocrylic 3359 DTMC - 3.0 to 4.0 mils DFT.
 - b. Pittsburgh Paints Company:
 - 1) First Coat: Pitt-Tech 90-812 Acrylic Dry Fall 2.0 to 4.0 mils DFT.
 - 2) Second Coat: Pitt-Tech 90-812 Acrylic Dry Fall 2.0 to 4.0 mils DFT.
 - 3) Third Coat: Pitt-Tech 90-812 Acrylic Dry Fall 2.0 to 4.0 mils
 - c. Sherwin-Williams Company (The):
 - 1) First Coat: ProIndustrial Muti-Surface Acrylic, B66-1550 applied at 1.5 to 2.5 mils DFT.
 - 2) Second Coat: ProIndustrial Muti-Surface Acrylic, B66-1550 applied at 1.5 to 2.5 mils DFT.
 - 3) Third Coat: ProIndustrial Muti-Surface Acrylic, B66-1550 applied at 1.5 to 2.5 mils DFT.
 - d. Tnemec:
 - 1) First Coat: Series 115 Uni-Bond DF applied at 2.0 to 3.0 mils DFT.

- 2) Second Coat: Series 1029 Enduratone applied at 2.0 to 3.0 mils DFT.
- 3) Third Coat: Series 1028 Enduratone applied at 2.0 to 3.0 mis DFT.

3.7 INTERIOR HIGH-PERFORMANCE COATING SYSTEMS

A. CMU Substrates:

1. Epoxy-Modified Latex System, Semi-gloss Finish:

a. Carboline:

- 1) Primer/Block Filler: ~~Carboline~~-Sanitile 100 Block Filler @ 5.0 to 16.0 mils DFT per coat.
- 2) ~~First Coat~~Primer/Block Filler (Upgrade): ~~Carboline~~-Sanitile 500 High-Performance Upgrade @ 5.0 – 20.0 mils DFT per coat.
- 3) ~~First~~/Second Coat: ~~Carboline~~-Sanitile 555 VOC @ 3.0 – 4.0 mils DFT.

b. Pittsburgh Paints Company:

- 1) ~~First Coat~~Primer/Block Filler: 4-100XI Permacrete Concrete and Masonry Block Surfer 8.0 to 11.0 mils DFT min.
- 2) Second/~~Third~~ Coat: 98E-1 Series, Aquapon WB EP Waterbased Catalyzed Epoxy 2.0 to 4.0 mils DFT.

c. Sherwin-Williams Company (The):

- 1) ~~First Coat~~Primer/Block Filler: ~~Kem-Cati-Coat HS Epoxy Filler/Sealer @ 10.0 to 20.0 mils DFT~~ Heavy Duty Block Filler B42W150.
- 2) Second/Third Coat: ~~Macropoxy 646-100 @ 5.0 to 10.0 mils DFT.~~ Pro Industrial Waterbased Catalyzed Epoxy Eggshell B73-300 Series @ 2.0 to 4.9 mils DFT.

d. Tnemec:

- 1) First Coat/Block Filler: Tnemec 54 Masonry Filler 75-100 sq ft/gallon.
- 2) Second Coat: Tnemec 288 Enviro-Pox @ 3.0-5.0 mils DFT.

B. ~~Steel Substrates and~~ Galvanized Metal Substrates:

1. Polyurethane, Pigmented, Over Epoxy Coating System, Semi-gloss Finish:

a. Carboline:

- 1) First Coat: ~~Carboline~~-Carboguard ~~235-635 @ 4.0 – 6.0 mils DFT.~~
- 2) Second Coat: ~~Carboline~~-Carbothane 133 LV ~~or 133~~ VOC @ 3.0 – 5.0 mils DFT.

b. Pittsburgh Paints Company:

- 1) First Coat: Amerlock 2/400 Polyamide Epoxy 4.0 to 8.0 mils DFT.
- 2) Second Coat: Pitthane Ultra LS 95-8901 Series 2.0 to 4.0 mils DFT.

c. Sherwin-Williams Company (The):

- 1) ~~First Coat: Zinc Clad II Plus @ 3.0 to 6.0 mils DFT.~~
- 2) ~~Second~~First Coat: Macropoxy 646-100 @ 3.0 to 10.0 mils DFT.
- 3) ~~Second~~/Third Coat: Acrolon 218 Polyurethane @ 3.0 to 6.0 mils DFT.

d. Tnemec:

- 1) First Coat/Primer: Tnemec N69 Hi-Build Epoxoline II @ ~~4-0~~ 4.0 to 6.0 mils DFT.
 - 2) Second Coat: Tnemec 1095 EnduraShield @ 2.0- to 3.0 mils DFT. (as you have it for some other steel exposures too).
- C. Steel: Unprimed Substrates and Factory-Primed Substrates:
1. Paint System: ~~WB Alkyd Urethane Enamel~~ Acrylic Aliphatic Polyurethane Enamel over primer, Semi-gloss Finish:
 - a. Carboline:
 - 1) Primer: CarboZinc 859 @ 3.0 to 5.0 mils DFT.
 - 2) ~~Carbocoat 8259WR 1.5 to 2.0 DFT.~~ First Coat: Carboguard 235 - 4.0 to 8.0 mils DFT.
 - 3) ~~Carbocoat 8259WR 1.5 to 2.0 DFT.~~ Second Coat: Carbothane 133 LV/ or 133 VOC @ 3.0 - 5.0 mils DFT.
 - b. Pittsburgh Paints Company:
 - 1) ~~Dimetecote 302H Inorganic Low VOC Zinc Rich Epoxy 2.0 to 4.0 mils DFT.~~ Primer: Amercoat 68HS Zinc Rich Epoxy Primer @ 2.0 to 5.0 mils DFT.
 - 2) First Coat: Amerlock 2/400 Polyamide Epoxy 4.0 to 8.0 mils DFT.
 - 3) Second Coat: Pitthane Ultra LS 95-8901 Series 2.0 to 4.0 mils DFT.
 - c. Sherwin-Williams Company (The):
 - 1) ~~Pro-Cryl Universal Water Based Primer; SW B66-310 Series 2.0 to 4.0 mils DFT.~~ Primer: Zinc Clad III HS Organic Zinc Rich Epoxy Primer @ minimum 5.0 mils DFT.
 - 2) ~~WB Alkyd Urethane Enamel Semi-Gloss; B53-1150 Series 1.5 to 2.0 DFT.~~ First Coat: Macropoxy 646-100 @ 3.0 to 10.0 mils DFT.
 - 3) ~~Same as second coat.~~ Second Coat: Acrolon 218 Polyurethane @ 3.0 to 6.0 mils DFT.
 - d. Tnemec:
 - 1) Primer: Series 90G-1K97, Tneme-Zinc - 2.5 to 3.5 mils DFT.
 - 2) First Coat: Series V69 Hi-Build Epoxoline II Polyamidoamine Epoxy - 4.0 to 6.0 mils DFT.
 - 3) Second Coat: Series 1081 Endura-Shield II. - 2.0 to 3.0 mils DFT.
- D. Gypsum Board Substrates:
1. High Performance Latex System, Semi-gloss Finish:
 - a. Carboline:
 - 1) First Coat: Sanitile 120 @ 1.0 - 2.0 mils DFT.
 - 2) Second Coat: Carbocrylic 3359 MC @ 2.0 - 3.0 mils DFT.
 - b. Pittsburgh Paints Company:
 - 1) First Coat/Primer: Pittsburgh Paints SealGrip Universal Latex Primer 17-921XI Series minimum 1.4 mils DFT.
 - 2) Second Coat/Third: Pittsburgh Paints Aquapon WB EP Epoxy Semigloss 98E-1 / 98E-100 2.0 to 4.0 mils DFT.
 - c. Sherwin-Williams Company (The):
 - 1) First Coat/Primer: ProMar 200 Zero ~~V.O.C.~~ VOC Latex Primer.

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Jackson, Mississippi
Addendum 1

Perkins & Will, PLLC, d/b/a Perkins&Will
Allen Pratt, Landscape Architect
802119.000
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- 2) Second/Third Coat: ~~ProMar 200 HP Zero V.O.C. Interior LatexPro~~
Industrial Waterbased Catalyzed Epoxy Eggshell B73-300 Series @
2.0 to 4.9 mils DFT.
- d. Tnemec:
 - 1) First Coat/Primer: Tnemec 1026 EnduraTone @ 2.0 -to 3.0 mils
DFT.
 - 2) Second/Third Coat: Tnemec 1026 EnduraTone @ 2.0 -to 3.0 mils
DFT.

END OF SECTION

SECTION 10 41 16

EMERGENCY KEY CABINETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Emergency key cabinets.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Including all pertinent performance characteristics and criteria.
 - 2. Shop Drawings: Indicate materials, construction, sizes, quantities, finishes, and installation details.
- B. Informational Submittals:
 - 1. Manufacturer's Instructions: For installation, maintenance, and repair.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with Section 01 60 00 - Product Requirements.

1.4 WARRANTY

- A. Provide warranties in accordance with Sections 01 60 00 - Product Requirements and 01 77 00 - Closeout Procedures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
 - 1. Knox Company.

2.2 PRODUCTS

- A. Fire Control Key Box: Provide fire department key control box ~~complete with alarm-tamper switch~~ at location near main entrance ~~to be determined~~ as indicated on Drawings.

1. Acceptable Product: Knox; Knoxbox 3200. Coordinate with Architect and authorities having jurisdiction.
 - a. Mounting: Recessed installation.
 - b. Color: As selected by Architect from manufacturer's standard colors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to receive work of this Section.
- B. Notify Architect of any existing conditions which will adversely affect execution.
- C. Beginning of execution will constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Prepare substrate surfaces as recommended by manufacturer.

3.3 INSTALLATION

- A. Install using skilled workers in accordance with manufacturer's published instructions and recommendations.

3.4 ADJUSTING

- A. Adjust and fit items to be flush with adjacent construction.
- B. Fasten or adhere for tight connections and joints.

3.5 CLEANING

- A. Perform final cleaning in accordance with Sections 01 60 00 - Product Requirements and 01 77 00 - Closeout Procedures.

3.6 PROTECTION

- A. Protect finished installation in accordance with Section 01 77 00 - Closeout Procedures.

END OF SECTION

SECTION 10 43 13

EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Automated external defibrillators (AEDs).
- B. Automated external defibrillator (AED) cabinets.

1.2 DEFINITIONS

- A. Automated External Defibrillator (AED): A Food and Drug Administration (FDA) approved portable device, which automatically analyzes the heart rhythm and recognizes the presence of ventricular fibrillation and/or tachycardia. If defibrillation is warranted, the AED automatically charges and prompts (visual and/or audio) the operator to deliver an electrical shock.

1.3 REFERENCE STANDARDS

- A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
- C. ASTM D4802 - Standard Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet.
- D. NAAMM AMP 500-06 - Metal Finishes Manual.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for AED cabinets.
 - 1. Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
 - 2. Show location of knockouts for conduit and wiring.
- B. Samples for Verification: For each type of exposed factory-applied color finish required for AED cabinets, prepared on Samples of size indicated below.
 - 1. Size: 6 by 6 inches square.

- C. Maintenance Data: For AED cabinets to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate size of AED cabinets to ensure that type and size of defibrillators to be provided by the Authority are accommodated.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
- B. Stainless-Steel Sheet: ASTM A666/A666M, Type 304.
- C. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), not less than 1.5 mm thick, with Finish 1 (smooth or polished).

2.2 AUTOMATED EXTERNAL DEFIBRILLATORS (AED)

- A. Manufacturers:
 - 1. Phillips Medical Systems .
 - 2. Stryker Corporation.
 - 3. ZOLL Medical Corporation .
- B. Basis of Design: Stryker Corporation; HeartSine samaritan PAD 350P Defibrillator - PAD 350p.

2.3 AUTOMATED EXTERNAL DEFIBRILLATOR (AED) CABINET

- A. Manufacturers:
 - 1. Activar Construction Products Group, Inc. - JL Industries.
 - 2. Larsens .
 - 3. Potter-Roemer .
- B. Basis of Design: 1417F12 LifeStart Series as manufactured by Activar Construction Products Group, Inc. - JL Industries.
- C. Cabinet Type: Suitable for automated external defibrillator.
- D. Cabinet Construction: Non-fire-rated.
 - 1. Formed stainless steel sheet; 0.036 inch (0.9 mm) thick base metal.
- E. Cabinet Material: Enameled-steel sheet.
- F. RSemi-recessed Cabinet: Cabinet box semi-recessed in walls of sufficient depth to suit style of trim indicated.
 - 1. Exposed Flat Trim 3" Rolled Edge Recessed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend) of 1/4 to 5/16 inch.

- G. Finish of Cabinet Exterior Trim and Door: ~~No. 4 Brushed Stainless Steel Powder coat, color as selected by Architect from manufacturer's full range.~~
- H. Door Style: Fully-glazed panel with frame.
- I. Door Glazing: Acrylic sheet.
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting door pull and friction latch.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- K. Accessories:
 - 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - a. Identify each cabinet with the words "AED - EMERGENCY DEFIBRILLATOR."
 - 1) Location: Applied to cabinet glazing.
 - 2) Application Process: Silk-screened, or decals with clear background.
 - 3) Lettering Color: Red.
 - 4) Orientation: Horizontal.
 - 2. Theft Alarm: Battery operated audible and strobe light alarm, 10 second delay for disarming, activated by opening cabinet door. Alarm deactivated when door is closed.
 - 3. Alarm Contacts: Contact devices.

2.4 FABRICATION

- A. AED Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM AMP 500-06 "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Finish cabinets after assembly.

2.6 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

~~STAINLESS STEEL FINISHES~~

~~General: Remove tool and die marks and stretch lines or blend into finish. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.~~

~~Bright, Directional Polish: No. 4 finish.~~

~~When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.~~

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for AED cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. Install AED cabinets in locations and at mounting heights indicated on Drawings. Fasten cabinets to structure, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed, unless otherwise indicated in manufacturer's written installation instructions.

- B. Adjust cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by cabinet manufacturer.
- E. Replace cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 11 31 00

APPLIANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Refrigeration and Ice Making appliances.

1.2 RELATED REQUIREMENTS

- A. Division-22 for plumbing and venting requirements
- B. Division-26 for electrical requirements

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.
- B. Product Schedule: For appliances. Use same designations indicated on Drawings.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each appliance to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.
- C. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.7 WARRANTY

- A. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- B. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace appliances or components that fail in materials or workmanship within specified warranty period.
- C. Refrigerator, Sealed System: Full warranty including parts and labor for on-site service on the product.
 - 1. Warranty Period for Sealed Refrigeration System: Two years from date of Substantial Completion.
 - 2. Warranty Period for Other Components: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 KITCHEN APPLIANCES

- A. Refrigerator, Type REF-1: Free-standing, ~~side-by-side~~, and ~~[]~~ two sections with glass doors.
 - 1. Capacity: Total minimum storage of ~~[50]~~ cubic ft (~~[1.42]~~ cu m).
 - 2. Compressor Location: Bottom.
~~Energy Usage: Minimum 20 percent more energy efficient than energy-efficiency standards set by U.S. Department of Energy (DOE).~~
 - 3. Features: Include glass shelves(4) heavy-duty epoxy-coated adjustable wire shelves per section, self-closing lockable doors remain open at 90 degrees, external LED temperature display, electronic thermostat, temperature range (33 F to 40 F), clip-on shelf tag holders, and 4-inch front-locking casters.
 - 4. Exterior and Interior Finish: Stainless steel.
 - 5. Manufacturers:
 - a. Frigidaire Home Products.
 - b. GE Appliances.
 - c. KitchenAid; a division of Whirlpool Corporation.
 - d. Sub-Zero, Inc.
 - e. Whirlpool Corp.
 - 6. Basis of Design Product: [TBD]Empura Refrigeration; E-KB Series Commercial Glass Door Refrigerator - Model #E-KB54RG
- B. Icemaker, Type IM-1:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Scotsman; Model #N0922 Prodigy Plus, or comparable product by one of the following:
 - a. KitchenAid; a division of Whirlpool Corporation.
 - b. Sears Brands LLC (Kenmore).
 - c. Sub-Zero, Inc.
 - d. Viking Range Corporation.

- e. Whirlpool Corporation.
- 2. Dimensions:
 - a. Width: 22 inches.
 - b. Depth: 24 inches.
 - c. Height: 27 inches.
- 3. Ice Capacity:
 - a. Production: 320 lb per day.
- C. Ice Bin/Storage:
 - 1. Basis-of-Design Product: Scotsman; Model #B322S.
 - 2. Dimensions:
 - a. Width: 22 inches.
 - b. Depth: 34 inches.
 - c. Height: 44 inches.
 - 3. Ice Capacity:
 - a. Production: 370 lb.

2.2 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Verify utility rough-ins are provided and correctly located.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: Comply with plumbing and electrical requirements.

3.3 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.4 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION

SECTION 13 31 00

ETFE TENSILE MEMBRANE SYSTEM

PART 1 GENERAL

SUMMARY

1.1 SECTION INCLUDES

- A. ~~This Section includes an~~ ETFE tensile membrane system and its supporting steel and/or cable structure.
- B. The ETFE ~~SYSTEM~~ tensile membrane system provider will be a single-source entity contractor (hereafter referred to as "Subcontractor") shall be responsible with responsibility for the detailing, fabrication, supply, and installation of the work specified ~~herein, some or all of which may be subcontracted by Subcontractor to others meeting the qualification requirements of Section 1.5. The intent of this specification is to establish in the first instance an undivided, single source responsibility of the Subcontractor for all of the foregoing functions.~~
- C. ~~Subcontractor's Work includes, but not necessarily limited to, the~~ Structural design, supply, fabrication, shipment, and erection of the following principal items :
 - 1. The ETFE system as indicated on the drawings and in these specifications.
 - 2. Cables and end fittings.
 - 3. Perimeter, catenary, and sectionalized aluminum clamping system.
 - 4. Structural steel, including masts, trusses, struts, beams, and/or weldments, as indicated on the drawings.
 - 5. Fasteners and gasketing.
- D. The ETFE system used in these structures shall be a composite system consisting of ETFE (Ethylenetetrafluoroethylene) film, aluminum attachment, perimeter flashings and if necessary cables ~~and/or mechanical equipment~~. All references to "ETFE system" in this Section, without exception, and whether singular, plural, or capitalized or not, are to such architectural systems.

1.2 RELATED REQUIREMENTS

- A. Section 01 13 00 - Delegated Design Requirements.
- B. Section 03 30 00-Cast-in-Place Concrete.
- C. Section 05 12 00-Structural Steel Framing.

1.3 REFERENCES

- A. General: Except as otherwise shown or noted, all Work shall comply with the requirements of the following codes and standards:
1. IBC (International Building Code), 2018 edition.
 2. American Architectural Manufacturers Association (AAMA).
 3. American Institute of Steel Construction (AISC).
 - a. AISC/ANSI 360-05 Specifications for Structural Steel Buildings
 - b. AISC 303-05 Code of Standard Practice for Steel Buildings and Bridges
 - c. AISC/ANSI 341-05 Seismic Provisions for Structural Steel Buildings
 4. American Society of Civil Engineers (ASCE).
 - a. ASCE 19: Structural Applications of Steel Cables for Buildings
 5. American Society for Testing and Materials (ASTM) International.
 - a. ASTM A586: Standard Specification for Zinc-Coated Steel Structural Strand
 - b. ASTM A603: Standard Specification for Zinc-Coated Steel Structural Wire Rope
 - c. ASTM C518: Standard Test Method for steady-state heat flux measurements and thermal transmission properties by means of the heat flow meter apparatus
 - d. ASTM C1363: Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
 - e. ASTM D4851: Standard Test Methods for Coated and Laminated Fabrics for Architectural Use
 - f. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials
 - g. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials (dry cup method)
 - h. ASTM E108: Standard Test Methods for Fire Tests of Roof Coverings
 - i. ASTM E424: Standard Test Method for Solar Energy Transmittance
 - j. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
 6. American Welding Society (AWS).
 - a. AWS D1.1: Structural Welding Code
 - b. AWS 2.4: Symbols for Welding and Nondestructive Testing
 7. Aluminum Association.
 - a. Specifications for Aluminum Structures
 8. National Fire Protection Association (NFPA).
 - a. NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
 9. Society for Protective Coatings (SSPC).
 - a. Steel Structures Painting Manual, Volumes 1 and 2

~~SYSTEM REQUIREMENTS~~

~~General: Provide an ETFE system that complies with requirements specified herein. The subcontractor shall submit a copy of test results for all tests listed in this section.~~

~~Building Code Criteria: The ETFE system shall comply with the State of IBC (International Building Code) Building Code, Insert year. 2018 edition. Controlling code and design criteria insertions below to be provided and verified by the Project Engineer.~~

~~Ground Snow Load: As indicated on Drawings.~~

~~Snow Load Importance Factor: As indicated on Drawings.~~

~~Roof Live Load: As indicated on Drawings.~~

~~Basic Wind Speed: As indicated on Drawings.~~

~~Wind Load Importance Factor: As indicated on Drawings.~~

~~Wind Exposure Category: As indicated on Drawings.~~

~~Design Mean Roof Height(s): As indicated on Drawings.~~

~~Life Safety: All ETFE systems shall be designed so that no life safety issue is created in the event of a loss of a part of the ETFE film. The ETFE system supporting structure shall not rely on the ETFE film for structural stability.~~

~~Fire Performance:~~

~~Burning Characteristics (ASTM E84): Class A~~

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site prior to commencing work of this section.

1. Require attendance of parties directly affecting work of this section, including:
 - a. Applicable subcontractors.
 - b. Contractor.
 - c. Membrane manufacturer field representative.
 - d. Architect.
 - e. Structural engineer.
 - f. Inspection and testing agency representative.
2. Review erection drawings, sequence, schedule, and procedures; tensile membrane handling, preparation, installation, adjusting, cleaning, and protection requirements, and coordination with related structural work.

~~QUALITY ASSURANCE~~

~~Subcontractor Qualifications: Fabrication and erection of the ETFE system is limited to firms with proven experience in fabrication and construction of complex membrane structures. Such firms, through their own experience and/or that of their qualified subcontractors, shall meet the following minimum requirements: The Subcontractor shall have at least fifteen (15) years' experience in the successful fabrication and erection of permanent, custom tensile membrane structures.~~

~~The Subcontractor shall have fabricated and erected at least fifty (50) air-inflated or tensile membrane structures.~~
~~The Subcontractor shall design, procure, fabricate and erect the ETFE system as described below.~~
~~The Subcontractor shall demonstrate it owns and operates a fabrication facility of adequate capacity and will maintain a staff experienced in the fabrication of ETFE films that will undertake the fabrication of this project.~~
~~Subcontractor shall demonstrate that the facility is ISO-certified and shall meet the specific requirements listed in Section 3 of this Specification.~~
~~The Subcontractor shall maintain an in-house Warranty and Service department to assist in repair and service calls.~~
~~The Subcontractor shall submit a Corporate Quality Control Manual describing the company's complete quality assurance program.~~

1.5 SUBMITTALS

~~General: Notwithstanding any provisions of these specifications that may appear to be to the contrary, any and all submittals by the Subcontractor shall be subject to review, approval, and adoption by the Engineer of Record as part of the overall project design and engineering, and shall not create a contractual or other professional design relationship between the Subcontractor and either the Engineer of Record or the Owner.~~

A. Action Submittals:

1. Product Data: Include manufacturer's specifications for materials, fabrication, installation, and recommendations for maintenance. Include test reports showing compliance with project requirements where test method is indicated.
2. Samples: Submit selection and verification samples.
3. Shop Drawings: For tensile membrane system. Include plans, elevations, sections, full-size details, and attachments to other work.
 - a. ETFE system drawings defining the completed structure, anchorage and connection details, interfaces with building construction, and general membrane seam arrangements.
 - b. Drawings to show all shop and erection details including cuts, copes, connection holes, threaded fasteners, bolts, studs and spacing, etc.
 - c. Drawings to show all welds, both shop and field, by the currently recommended symbols of the AWS.
 - d. A welding procedure must be submitted to the Professional Structural Engineer for approval of welds that are not prequalified.
 - e. The fabricator shall not fabricate any material until after receipt of approved shop drawings.
 - f. Certification of material conformance that includes chemical and physical properties for all structural elements shall be submitted for review.

4. Delegated Design Submittal: Tensile membrane systems, including support framing, connections, and related hardware shall be designed under the direct supervision of a Professional Structural Engineer experienced in the design of the work and licensed in the State of Mississippi, using performance and design criteria, and requirements specified in this Section.
5. Design Calculations: Submit complete calculations for the tensile membrane structure, as one package with the design drawings, signed and sealed by a Professional Structural Engineer licensed in the State of Mississippi. Structural calculations to include all required loading cases and load combinations used in the design and resulting member forces, reactions, deflections, and drift. The magnitude of maximum reactions on the supporting structures from all critical load combinations are to be separately tabulated. Critical load conditions used in the final sizing of the members shall be emphasized.

B. Informational Submittals:

1. Qualification Data:
 - a. For Installer and field testing agency.
 - b. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.
 - c. For Steel Fabricator: Not less than five (5) years' continuous experience in the fabrication of structural steel.
2. Test Reports: Provide test reports from a qualified testing laboratory that show compliance of the ETFE system with specification requirements.
3. Certificates: Product certificates signed by the ETFE system fabricator certifying materials comply with specified characteristics, criteria, and physical requirements.
4. Source quality-control reports.
5. Sample Warranties: For special warranties.

Prequalifications:

~~Submittals With Bid: The General Contractor shall submit with its bid the following materials from the Subcontractor:~~

~~Schedule indicating key milestone dates during the project.~~

~~Pre-qualification package including:~~

~~Company background and years of experience~~

~~Organizational chart and staff C.V.~~

~~List of past project references.~~

~~Client recommendations~~

~~Fabrication facility documentation:~~

~~Background, including proof of ownership and years of operation~~

~~Physical address~~

~~ISO certifications for Design and Fabrication facilities~~

~~Shop Drawings: Subcontractor shall submit ETFE system drawings defining the completed structure, anchorage and connection details, interfaces with building construction, and general membrane seam arrangements.~~

~~Delegated Design Submittal: Tensile membrane systems, including support framing, connections, and related hardware shall be designed under the direct supervision of a Professional Structural Engineer experienced in the design of the work and licensed in the State of Mississippi, using performance and design criteria, and requirements specified in this Section.~~

~~Quality Assurance Submittals:~~

~~Test Reports: Provide test reports from a qualified testing laboratory that show compliance of the Subcontractor's ETFE system with specification requirements, as follows:~~

~~Physical test data of the actual film roll goods to be used in the project confirming conformance with specifications for the film.~~

~~Product data for other components confirming conformance with specifications.~~

~~Certificates: Product certificates signed by the Subcontractor certifying materials comply with specified characteristics, criteria, and physical requirements.~~

C. ~~Closeout Submittals:~~

~~Warranty: Project Warranty documents as described herein.~~

1. Record Documents: Project record documents for installed materials in accordance with ~~Conditions of the Contract and Division 1 Submittal Procedures Section~~ Section 01 78 39 - Project Record Documents.
2. Maintenance Manual: Submit two (2) copies of a maintenance manual for the ETFE system to the Owner. ~~The manual shall include~~ a schedule for routine inspection, an inspection checklist, instructions for emergency repair and use of emergency repair materials, and warranty. During the system erection period, the Owner shall provide maintenance personnel to be trained in the use of the repair materials.
3. Samples: Submit samples for proposed ETFE and aluminum extrusion connection finishes. Minimum 12" x 12" in dimension.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located; with at least fifteen (15) years of documented experience.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least fifteen (15) years of documented experience.
- C. Fabricator/Installer Qualifications: Company specializing in fabricating products specified in this section, have at least fifteen (15) years experience in the successful fabrication and erection of permanent, custom tensile membrane structures.
 1. Fabricator to have fabricated and erected at least fifty (50) tensile membrane structures.

- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least fifteen (15) years of documented experience and approved by manufacturer.

1.7 PRODUCT DELIVERY, HANDLING, AND STORAGE

- A. Materials shall be packed, loaded, shipped, unloaded, stored, and protected in a manner that will avoid abuse, damage, and defacement.
- B. Deliver materials to project site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- C. Store products under cover, elevated above grade, and in dry, well-ventilated areas not exposed to heat or sunlight.
- D. Handle fabric in accordance with manufacturer's instructions.

1.8 WARRANTY

- A. ~~After final payment, the Subcontractor shall furnish the Owner with a written~~ETFE Base Material Warranty;~~which warrants that t~~he ETFE system, its perimeter attachment system, and the structural support system as supplied ~~by the Subcontractor~~ have been installed in accordance with the project specifications ~~and will be free from defects in materials and workmanship that will impair their normal use or service. The Warranty shall start from the date of Substantial Completion of the ETFE system; which shall be the first date on which the entire ETFE system is installed, and continue for a period of Ten (10) years thereafter.~~
1. Warranty Period: 10 years from date of Substantial Completion.
- B. ETFE Support Structure Warranty: The ETFE support structure and its perimeter attachment system have been installed in accordance with the project specifications and will be free from defects in materials and workmanship that will impair their normal use or service.
1. Warranty Period: 2 years from date of Substantial Completion.
- C. The warranty shall not cover defects caused by the following:
1. Acts of God or other casualty.
 2. Damage to the Fabric caused by application of cleaners, solvents, and/or penetrations not otherwise approved in writing by ~~Supplier/Subcontractor.~~ Manufacturer/Installer.
 3. Damage occurring due to the failure to mitigate damages.
 4. Damage due to inappropriate repairs and maintenance.
 - a. Acts of vandalism or terrorism.
 - b. Improper modification, servicing, or operation.
 - c. Negligence or default of the Owner, or the negligence or default of any third party.
 - d. Outside interference with the System
 - e. Actions of rodents and animals.
 - f. Exceptional meteorological events
 - g. Excessive settlement or movement of the supporting structure.

- h. Perils for which the System was not designed.
- i. Modification or addition to the ETFE system performed without the express written consent of the subcontractor.

Limitations on Warranty:

~~The ETFE subcontractor's liability under this warranty shall be limited to the cost of the remedial or replacement work required solely at its digression. The subcontractor shall not be liable for damages for loss of use, or other consequential damages. The maximum value of any works carried out during the Warranty period shall not exceed the value of the supply and installation of the system under the construction contract.~~

~~This Limited Warranty is in lieu of all other express warranties, obligations or liabilities.~~

~~The Owner agrees that any action for breach of warranty, including, but not limited to, breach of implied warrantabilty or merchantability, shall commence within 6 months of the expiration of the limited warranty.~~

~~Owner acknowledges that, prior to acceptance of this Limited Warranty; it has received instruction on its responsibilities in caring for and maintaining the system.~~

D. Maintenance/Extended Warranty:

- 1. Include a separate price for regular inspection and maintenance agreement of the ETFE system to begin 1 year after Substantial Completion of the Project in order to meet warranty requirements. The maintenance contract will be directly with the Owner.
- 2. The ETFE subcontractor ~~shall~~will visit the site on a yearly basis for inspection and maintenance of the system upon Owners acceptance of the regular inspection and maintenance agreement. The exact schedule shall be as determined between the Owner and the subcontractor.
- 3. The Owner agrees to furnish access to the installation. ~~The ETFE subcontractor shall include the cost for limited access due to those requirements.~~ Repair and replacement of materials and components covered by warranty shall be performed at no additional cost to the Owner. The maintenance contract shall include a schedule of prices for replacement of major components not covered by the warranty.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a Professional Structural Engineer licensed in the State of ~~{Mississippi}~~, as defined in Section 01 40 00 - Quality Requirements, to design tensile membrane systems.
- B. General Performance: Comply with performance requirements specified, as determined by testing of tensile membrane systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

C. System Requirements:

1. General: Provide an ETFE system that complies with requirements specified herein. Submit a copy of test results for all tests listed in this section.
2. Building Code Criteria: The ETFE system will comply with the 2018 IBC (International Building Code) edition with Amendments, and the State of Mississippi authorities having jurisdiction. Controlling code and design criteria insertions below to be provided and verified by the Project Engineer.
 - a. Ground Snow Load: As indicated on Drawings.
 - b. Snow Load Importance Factor: As indicated on Drawings.
 - c. Roof Live Load: As indicated on Drawings.
 - d. Basic Wind Speed: As indicated on Drawings.
 - e. Wind Load Importance Factor: As indicated on Drawings.
 - f. Wind Exposure Category: As indicated on Drawings.
 - g. Design Mean Roof Height(s): As indicated on Drawings.
3. Life Safety: All ETFE systems shall be designed so that no life safety issue is created in the event of a loss of a part of the ETFE film. The ETFE system supporting structure shall not rely on the ETFE film for structural stability.
4. Fire Performance:
 - a. Burning Characteristics (ASTM E84): Class A

2.2 MANUFACTURERS

- A. The ETFE system provider is responsible for the detailing, fabrication, supply, and installation of the work specified herein.
- B. Tensile Membrane Structures:
 1. Basis of Design: Provide ETS - Enclos Tensile Structures Inc.; ETFE System or a comparable product by one of the follow manufacturers / fabricators / installers:
 - a. Birdair, Inc.
 - b. Fabritecture.
 - c. Lightspan.
 - d. NOVUM Structures.

2.3 ETFE SYSTEM

- A. General: The ETFE System used in these structures shall be made of a (Single) Layer colored (translucent) / printed ETFE (tensioned) system. The number and thickness of layers shall be determined by ~~the subcontractor~~ delegated design Professional Structural Engineer according to the below thermal and structural specifications. The color and/or printing of the ETFE shall be applied as to respond to the required solar specifications.

2.4 ETFE FILM

- A. General: The ETFE Film used in these structures shall be based on building conditions. ETFE Films shall be manufactured by one of the following:
 1. AGC Chemicals Americas, Inc., Exton, PA, USA

2. Nowofol GmbH, Siegsdorf, Germany
3. ~~Pati srl~~ PATI, Italy

B. The ETFE ~~f~~ilm ~~shall meet the following g~~General ~~r~~Requirements:

1. Source Quality Control: The primary materials ~~shall~~ are to be obtained from a single manufacturer. Secondary materials shall be those recommended by the primary manufacturer.
2. Physical Characteristics: The following indicates a range of physical properties typical of ETFE films. The determination of specific characteristics and selection of a film shall be derived from ~~project engineering by the Project Engineer. analysis and calculations carried out by the Professional Structural Engineer for this project.~~
- a. Specific Gravity: 1.70 – 1.76 (ASTM D792)
- b. Thickness (mils): 0.5 - 40. (ASTM 4851)
- c. Print:
 - 1) The overall printing area shall be ____ %
 - 2) The Light transmission through the printed film shall be ____ %
- d. Solar Transmission of clear film: ____ % (ASTM E424)
3. Refractive Index: 1.4% (ASTM D542)
4. Water absorption: <0.03% (24 hrs)

2.5 CABLES AND END FITTINGS

A. Materials:

1. All structural wire rope cables, except stainless steel, shall conform to the latest revision of ASTM A603.
2. All structural strand cables, except stainless steel, shall conform to the latest revision of ASTM A586.
3. All cables, except stainless steel, shall be coated to "Class A" zinc coating throughout.
4. All cables in contact with the membrane shall be white PVC coated
5. Reinforcement cable for the single layer ETFE system shall be made of stainless steel, AISI 304 or AISI 316.

B. Fabrication:

1. Cable fabricator ~~shall~~ to provide ~~effective~~ quality control over all fabrication activities. Inspection of the place of fabrication may occur at any time to verify proper quality control. This inspection does not relieve the fabricator from meeting the requirements of this specification.
2. Cables that are designated to be pre-stretched shall be pre-stretched per ASTM A603 for wire rope and ASTM A586 for structural strand. Cables of the same type shall have the same modulus of elasticity.
3. All cables shall be manufactured to the following length tolerances at 70 degrees Fahrenheit (23 degrees Celsius):
 - a. ~~Length < 70 feet (2133.6 cm) 1/4 inch (0.25 inch (6.4 mm))~~

Length < 70 feet (2133.6 cm) 1	1/4 inch (0.25 inch (6.4 mm))
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 - b. ~~Length 70 to 270 feet (8229.6 cm) 0.03% of length~~

Length 70 to 270 feet (8229.6 cm)	0.03% of length
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- c. ~~Length > 270 feet (8229.6 cm)~~ ~~1 inch (25.4 mm)~~
Length > 270 feet (8229.6 cm) 1 inch (25.4 mm)

4. Cables shall have a continuous longitudinal paint stripe (1/4-inch wide max) along their top surface unless noted otherwise.
5. Index markings shown shall be a circumferential paint stripe (1/4-inch wide max).
6. All cables and end fittings shall be delivered clean and dry.
7. All swaged and speltered fittings shall be designed and attached to develop the full breaking strength of the cable. Thimble end fittings shall develop a minimum of 90 percent of the cable breaking strength.
8. Swaged end fittings, pins, nuts, and washers shall be hot dip galvanized per ASTM A153. Any damage to the zinc coating shall be cleaned and painted with a gray zinc-rich paint per ASTM A780.
9. Speltered end fittings shall be hot dip galvanized per ASTM A153. Any damage to the zinc coating shall be cleaned and painted with a gray zinc-rich paint per ASTM A780.

2.6 ALUMINUM CLAMPING SYSTEM

A. Materials:

1. All structural aluminum clamping systems ~~shall to~~ be Aluminum Association alloy 6061-T6 or alloy 6063-T6, or shall be EN AW-6060-T66.
2. Bent plates ~~shall to~~ be formed and then heat-treated to T6 or T66, as applicable.
3. All structural "U Straps" ~~shall to~~ be stainless steel, type AISI 316.
4. All structural aluminum clamping ~~shall to~~ have the following finish :
 - a. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Color: White..
5. Structural sheet aluminum ~~shall to~~ be ASTM alloy 5052-H32.
6. Non-structural sheet aluminum ~~shall to~~ be ASTM alloy 1100 series.

B. Fabrication:

1. Aluminum fabricator ~~shall will~~ provide ~~effective~~ quality control over all fabrication activities. Inspection of the place of fabrication may occur at any time to verify proper quality control. This inspection does not relieve the fabricator from meeting the requirements of this specification.
2. Fabricated aluminum ~~shall will~~ have no sharp edges.
3. Stamp all parts with the appropriate mark number.
4. All fabricated aluminum ~~shall will~~ be free of oil, grease, and machining chips.
5. Tolerances shall be as follows:

- a. Cross ~~s~~Sectional ~~d~~Dimensions: +/- 10%, ~~0.03-inch~~ 0.03 inch (0.8 mm)-max.
 - b. Bolt ~~hole~~Hold~~d~~Locations: +/- 1/32 inch (0.79 mm)
 - c. Overall ~~t~~Length: _____ +/- 1/16 inch (1.59 mm)
6. All welded joints ~~shall to~~ conform to AWS D1.2.

2.7 STRUCTURAL STEEL

- A. General: The structural steel fabrication ~~shall to~~ comply with the latest revision of all applicable codes, standards, and regulations including the following:
1. AISC: "Specification for Structural Steel Buildings" and "Code of Standard Practice for Steel Buildings and Bridges."
 2. SSPC: "Steel Structures Painting Manual, Volumes 1 and 2."
 3. Research Council on Riveted and Bolted Structural Joints: "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
 4. AWS D1.1 and AWS A2.4.
- B. In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, the provisions of the more stringent shall govern.
- C. Materials:
1. Structural steel for plates and bars ~~shall to~~ conform to the requirements of ASTM A36 or ASTM A572, Grade 50, unless noted otherwise, ~~or other as specifically approved by the Engineer of Record.~~
 2. Structural pipe ~~shall to~~ conform to ASTM A53, Types E or S, Grade B, ~~or other as specifically approved by the Engineer of Record.~~
 3. Structural tubing ~~shall to~~ conform to ASTM A500 Grade B.
 4. Structural bolts.
 - a. High ~~s~~Strength ~~b~~Bolts: _____ ASTM A325, unless noted otherwise.
 - b. Common ~~b~~Bolts and ~~n~~Nuts: _____ ASTM A307.
 - c. Threaded ~~r~~Rods: _____ ASTM A36, unless noted otherwise.
 5. Other materials: ~~Provide A~~all other materials, not specifically described but required for a complete and proper installation of structural steel, ~~shall be provided and shall be new, free from rust, first quality of their respective kinds, and subject to the approval of the Subcontractor.~~
- D. Accessories:
1. Base Plates and Anchor Bolts: ~~i~~
 - a. Base plates supported on concrete, whether shop attached or shipped loose, ~~shall are to~~ be furnished and set on shims, leveling plates or leveling nuts. Grouting ~~shall be by the General Contractor as required per delegated design.~~

- b. Anchor bolt locations ~~shall to~~ be furnished ~~by the Subcontractor and used by the General Contractor~~ to set the bolts in concrete prior to pour. ~~The General Contractor is to check carefully the setting of the bolts to their proper position prior to placing of concrete.~~ Anchor bolts, ~~provided by the General Contractor, shall to~~ have two (2) nuts and washers. Damaged threads shall be repaired or be cut to permit full tightening of nuts.
- E. Fabrication:
- 1. Workmanship: All members, when finished, ~~shall to~~ be true and free of twists, bends, and open joints between the component parts. Members ~~shall to be thoroughly~~ straightened in the shop by methods that will not damage them, before being worked on in any way.
 - a. Properly mark materials, and match-mark ~~when directed by the Subcontractor,~~ for field assembly where required.
 - b. Grind all edges and corners that could contact membrane to a minimum 1/16 inch (1.6mm) radius.
 - 2. Connections:
 - a. Connections shall be as indicated on the drawings. When details are not shown the connections shall conform to the requirements of the AISC.
 - b. Provide high-strength threaded fasteners for all structural steel bolted connections, unless noted otherwise.
 - c. Combination of bolts and welds in the same connection are not permitted, unless otherwise detailed.
 - d. Welded Connections.
 - 1) Definitions: All terms herein relating to the welds, welding and oxygen cutting ~~shall to~~ be construed in accordance with the latest revision of "Standard Definitions of Welding Terms and Master Chart of Welding Processes" of the AWS.
~~Operators: Welds shall be made only by operators who have been previously qualified by tests, as prescribed in AWS D1.1 to perform the type of work required.~~
~~Welding equipment shall be of sufficient capacity and maintained in good working condition, capable of adjustment in full range of current settings. Welding cables shall be adequate size for the currents involved and grounding methods shall be such as to insure proper machine operation.~~
 - 2) No welding ~~shall to~~ begin until joint elements are clamped in proper alignment and adjusted to dimensions shown on the drawings with allowance for any weld shrinkage that is expected. No members are to be spliced without prior approval.
 - 3) All welding shall be done in accordance with the reference specifications, with the following modifications and additions:
 - (a) All field welding ~~shall will~~ be done by manual shielded metal-arc welding.
 - (b) All groove welds ~~shall to~~ have complete penetration, unless otherwise specified on the drawings.

- (c) The minimum preheat and interpass temperature requirements ~~shall to~~ be as required per AWS D1.1.
- 4) Welding Sequence: Heavy sections and those having a high degree of restraint must be welded in a sequence with the proper preheat and post-weld heat treatment such that no permanent distortion occurs. Submit a welding sequence for approval for these types of connections.
 - (a) Oxygen Cutting: Manual oxygen cutting ~~shall to~~ be done only with a mechanically guided torch. Alternatively, an unguided torch may be used provided the cut is not within 1/2 inch (12.7 mm) of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal edges. The use of oxygen-cut holes for bolted connections will under no circumstances be permitted, ~~and violation of this clause will be sufficient cause for the rejection of any pieces in which oxygen cut holes exist.~~
- 3. Tolerances: All tolerances ~~shall be as are~~ per the AISC "Code of Standard Practice for Steel Buildings and Bridges."
- 4. Paint System, Two-Coat; Zinc Polyurethane:
 - a. Source Quality Control: Primary materials ~~shall to~~ be obtained from a single manufacturer. Secondary materials ~~shall to~~ be those recommended by the primary manufacturer.
 - b. Surface Preparation and Prime Coat:
 - 1) ~~Surface preparation shall be e~~Commercial blast cleaning SSPC-SP-6, after all fabrication operations such as machining and welding are complete. There shall be a maximum of eight hours elapsed time between surface preparation and application of the prime coat.
 - 2) Protect all drilled and tapped holes and/or threaded studs prior to painting such that all bolted connections can be made by ~~subcontractor or membrane structure~~ erector without first cleaning threads.
 - 3) Primer: ~~shall be~~ International Paint Interzinc 315 or approved equal, ~~@ 2.5 - 3.0 mils DFT, and shall comply with the composition and performance requirements of SSPC paint specification No. 20.~~
 - (a) Comply with the composition and performance requirements of SSPC paint specification No. 20.
~~Primer shall be mixed and applied in accordance with manufacturer's instruction and technical product datasheets. The dry film thickness shall be 2.5-3 mils (0.0762 mm).~~
 - c. Finish Coat:
 - 1) Finish ~~e~~Coat: ~~shall be~~ International Paint Interthane 870 series or approved equal, ~~@ 4.0 - 5.0 mils DFT, and shall comply with the composition and performance requirements of SSPC paint specification No. 36.~~

- (a) Comply with the composition and performance requirements of SSPC paint specification No. 36
~~Finish coat shall be mixed and applied in accordance with manufacturer's instructions and technical product datasheets. The dry film thickness shall be 4-5 mils (0.127 mm). Total system dry film thickness shall be 6.5-8 mils (0.2032 mm).~~
- 2) Color and Gloss: As selected by Architect from manufacturer's full range.
- d. Finish Quality:
 - 1) Dry paint shall be uniform and continuous with no voids or puddles and shall not be broken by scratches or nicks.
~~Care and Handling:
Painting subcontractor shall make every reasonable effort to ensure the painted steel is thoroughly dry and it is handled carefully to prevent aesthetic or structural damage. Nylon slings shall be used when handling painted steel.~~
~~Certification:
Painting Subcontractor shall certify the paint manufacturer's name, paint identification, conformance with manufacturer's written instructions, and the paint dry mil thickness.~~

Source Quality Control:

Testing:

~~An independent testing laboratory paid for by the Owner shall perform testing and inspection of the structural steel and welding. All welds shall be tested by visual, dye penetrant, magnetic particle methods, or ultrasonic methods in accordance with instructions from the Subcontractor.~~
~~The Subcontractor and the testing laboratory inspector shall be permitted to inspect the work in the shop or field throughout fabrication and erection.~~
~~The inspector shall check for workmanship of steel, both in the shop and field, and check general compliance with the Contract Documents and steel shop drawings. The inspector shall record types and locations of all defects found in the work and measures required and performed to correct such defects.~~
~~The steel fabricator shall make all repairs to defective work to the satisfaction of the inspector and at no additional cost to the Subcontractor.~~
~~The inspector shall submit reports of his inspection and test findings to the Subcontractor. He shall record all defects found with subsequent repair operations and submit reports to the Subcontractor.~~
~~The work of the independent inspector shall in no way relieve the steel fabricator of his responsibility to comply with all requirements of the Contract Documents.~~

~~Product Handling and Protection: Use all means necessary to protect structural steel before, during, and after installation and to protect the installed work and materials of all other trades.~~

~~Rejection and Replacement:~~

~~In the event of damage to the steel, immediately make all repairs and replacements necessary to the approval of and at no additional cost to the Subcontractor.~~

~~Any materials or welding rejected through inspection either in the shop, mill or field must be promptly replaced to the satisfaction of, and at no additional cost to, the Subcontractor.~~

~~Qualifications of Steel Fabricator: The steel fabricator shall have not less than five (5) years' continuous experience in the fabrication of structural steel.~~

2.8 FASTENERS

- A. General: Provide fasteners used to secure clamp systems to curbs and cables, assemblage of clamp systems, and other fasteners as required to complete the work specified herein.
- B. Materials:
 - 1. All work ~~shall~~to comply with the latest edition of ASTM standards and American Iron and Steel Institute (AISI), as referenced herein.
 - 2. Fasteners used in membrane clamping systems ~~shall~~to be stainless steel. Bolts and studs ~~shall~~will conform to ASTM F593, Type 304, or ~~shall~~to be grade A2-70 per DIN/ISO. Nuts shall conform to ASTM F594, Type 316, or shall be grade A4-70 per DIN/ISO. Washers ~~shall~~to be plain, narrow, and conform to AISI Type 18-8.
 - 3. All clamping systems subjected to relative movement between clamping and curb shall receive a split-ring lock washer conforming to AISI Type 18-8.
 - 4. Unless otherwise specified on the drawings, all other bolts and nuts shall conform to ASTM A307-76B, zinc plated to conform to ASTM B633 Class Fe/Zn 8 type III.

~~Source Quality Control: The manufacturer shall certify that all fasteners comply with the above referenced specifications.~~

2.9 GASKETING

- A. Sponge Neoprene Gasketing:
 - 1. Material:
 - a. All sponge neoprene shall be of a cellular elastomeric compound of a firm grade, which has been manufactured in pre-formed shapes for use as gasket and sealing material, as specified in ASTM ~~specification~~ C509.
 - b. Cellular elastomeric materials furnished to this specification ~~shall~~will be manufactured from natural or synthetic rubber, or mixtures of these, with added compounds of such nature and quality that, with proper curing, the finished product will comply with this specification.

- c. The cured compounds shall be suitable for use where resistance to sunlight, weathering oxidation, and permanent deformation under load are of prime importance.
- d. The manufacturing process ~~shall be such as will to~~ ensure a homogeneous cellular material free of defects that may affect serviceability.
- e. The physical characteristics of the neoprene must meet or exceed ASTM C509, "Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Materials."
- f. Certification of material ~~shall to~~ be provided that conforms to ASTM C509.

B. EPDM Gasketing:

1. All EPDM Material shall be of a grade which has been manufactured for use as gasket and sealing material.
2. The cured compounds ~~shall to~~ be suitable for use where resistance to sunlight and weathering oxidation are of prime importance.
3. The manufacturing process ~~shall be such as will to~~ ensure a material free of defects that may affect serviceability.
4. The physical characteristics must meet or exceed the following physical test requirements when tested using the latest standard ASTM test slab can compression set plug (or approved equal):

PROPERTY	ASTM TEST METHOD	LIMITS
Shore A Durometer D 2240		60 – 70
Tensile Strength (Min.) D 412		1,305 psi (8997.66 kPa)
Percent Elongation (Min.) D 412		350%
Tear Resistance (min.) D 624		175 lbs./in
Resistance to Heat Aging: D 573		
Tensile Strength (Min.) D 412		1,200 psi (8273.71 kPa)
Elongation, Ultimate (Min) D 412		225%
Tear Resistance (min.) D 624		150 lbs./in
Linear dim. change (Max) D 1204		2%
Ozone Resistance D 1149		no cracks
Low temp. brittleness D 746		75 F
Water absorption (Max) D 471		4%
Water Vapor permeability E 96		2.0 (Max)
Ultra-Violet Weathering:		
Tensile Strength (Min.) D 412		1,200 psi (8273.71 kPa)
Elongation, (Min) D 412		225%
Sheet Composition D 297		30% Min
Weight % Sheet of EPDM Polymer		

	PROPERTY	ASTM TEST METHOD	LIMITS
a.	Shore A Durometer	D 2240	60 – 70
b.	Tensile Strength (Min.)	D 412	[1,305] psi [8997.66] kPa
c.	Percent Elongation (Min.)	D 412	350%

d.	<u>Tear Resistance (min.)</u>	<u>D 624</u>	<u>175 lbs./in</u>
e.	<u>Resistance to Heat Aging:</u>	<u>D 573</u>	
	<u>Tensile Strength (Min.)</u>	<u>D 412</u>	<u>[1,200] psi</u> <u>([8273.71] kPa)</u>
	<u>Elongation, Ultimate (Min)</u>	<u>D 412</u>	<u>225%</u>
	<u>Tear Resistance (min.)</u>	<u>D 624</u>	<u>150 lbs./in</u>
	<u>Linear dim. change (Max)</u>	<u>D 1204</u>	<u>2%</u>
f.	<u>Ozone Resistance</u>	<u>D 1149</u>	<u>no cracks</u>
g.	<u>Low temp. brittleness</u>	<u>D 746</u>	<u>-75 F</u>
h.	<u>Water absorption (Max)</u>	<u>D 471</u>	<u>4%</u>
i.	<u>Water Vapor permeability</u>	<u>E 96</u>	<u>2.0 (Max)</u>
j.	<u>Ultra Violet Weathering:</u>		
	<u>Tensile Strength (Min.)</u>	<u>D 412</u>	<u>[1,200] psi</u> <u>([8273.71] kPa)</u>
	<u>Elongation, (Min)</u>	<u>D 412</u>	<u>225%</u>
k.	<u>Sheet Composition</u>	<u>D 297</u>	<u>30% Min</u>
	<u>Weight % Sheet of EPDM</u>		
	<u>Polymer</u>		

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine area to receive flexible structural elements and tensile membrane; notify Architect if area is not acceptable and do not begin installation until unacceptable conditions have been corrected.
- B. Examine foundations and anchor bolts for location and elevation; notify Architect of inaccuracies, and do not begin installation until unacceptable conditions have been corrected.

3.2 PREPARATION

- A. Prepare a clear, flat, smooth, and clean layout area on ground of sufficient size for assembly of tensile membrane panels; prepare area adjacent to location of structure installation.
- B. Check contact surfaces to remove sharp objects, dirt, grease, oil, and other causes for rips, scratching, or other damage to tensile membrane panels during installation.

3.3 FABRICATION ~~OF INSULATED~~ MEMBRANE PANELS

A. General:

~~ETFE assembly shop drawings shall include all information necessary for the fabrication by the Subcontractor of the ETFE System. They shall include size and shape of envelope, type and location of shop and field connections, size, type, and extent of all heat welded seams.~~

1. ~~The Subcontractor~~Installer shall take necessary care to plan and assemble the fabricated sections such that the assembly has no shop patches. Splices, if any, shall be patterned into a symmetrical and repetitive geometric arrangement within the assembly, shown on the shop drawings and, where feasible, hidden by structural members.
2. Uniaxial Test: At least one (1) representative sample of the ETFE film shall be uniaxially test loaded. ~~Compensation in patterning shall be based upon the results of the uniaxial test loading.~~

3.4 ERECTION OF ETFE SYSTEM

~~Prior to installation of the ETFE System, the Subcontractor shall meet with the General Contractor to review the erection procedure and scheduling. The Subcontractor shall coordinate all work with other trades.~~

- A. Erect tensile membrane structures and flexible structural elements in accordance with erection requirements of ASCE 55.
- B. Comply with approved erection plan.
- C. Do not undertake erection of tensile membranes during inclement weather conditions; Installer has sole responsibility to determine when conditions are safe for erection.
- D. Install tensile membranes and flexible structural elements in accordance with manufacturer's instructions.
 1. Install to avoid damage to tensile membranes.
 2. Ensure tensile membranes surfaces are smooth, uniform, and clean, with even-curved edges and interfaces, and with no cuts, scratches, abrasions, stains, marks, blemishes, or welding irregularities.

~~No trade shall have access to, or work from ETFE system, unless authorized by the Subcontractor in writing.~~

E. Erection of Structural Steel: i

~~The Subcontractor shall employ a competent foreman to supervise all work of steel erection. This foreman shall be present at all times during the Subcontractor's scope of work.~~

1. All precautions shall be taken to ensure an accurately located and completely safe and stable structure at all times. Adequate guy cables shall be used throughout the work and all erection bolts shall be drawn up tight.
2. All steel ~~shall to~~ be accurately aligned before permanent connections are made.

3. Temporary bracing ~~shall~~is to be left in place as long as may be required for safety. The bracing shall be located so it does not interfere with the erection of the tensile membrane structure, and can be removed as required during construction.
 - a. The structure is to be self-supporting and stable after the installation is fully completed.
4. Erection tolerances shall be specified in the AISC "Code of Standard Practice for Steel Buildings and Bridges," including those related to placement of anchor bolts, unless otherwise indicated.
 - a. Tensile membrane structures (including individual membrane panels, insulated and/or uninsulated) are pre-engineered and pre-fabricated to fit a specific theoretical dimension. For those primary and secondary structural elements to which the membrane structure (including an individual membrane panel) is connected, the erected position of member working points, including those of cantilevered members, shall not vary from the theoretical model by more than 1-inch (25mm) in any direction, either individually, or cumulatively across a shipping piece. This includes but is not limited to: cable connection points, membrane panel edges, membrane bearing locations, intermediate splice points of field-spliced members, hardware connections, weldments and their anchorages. For arched members, include the three-dimensional location of the member midpoint as a working point for tolerance measurement.
 - b. The cumulative effect of dimensional steel discrepancies shall be such that the distance between membrane panel support points does not vary more than 1-inch (25mm) from the theoretical dimension within each membrane panel.
 - c. All steel structures that support tensioned membrane must maintain an uninterrupted drainage path and a minimum constant slope of 5 degrees from all points of the membrane.

~~In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, the provisions of the more stringent shall govern.~~

3.5 FIELD QUALITY CONTROL

A. Testing:

1. Owner to engage an independent testing laboratory to perform testing and inspection of the structural steel and welding. All welds to be tested by visual, dye penetrant, magnetic particle methods, or ultrasonic methods.
2. The fabricator/installer and the testing laboratory inspector shall be permitted to inspect the work in the shop or field throughout fabrication and erection.
3. The inspector will check for workmanship of steel, both in the shop and field, and check general compliance with the Contract Documents and steel shop drawings. The inspector will record types and locations of all defects found in the work and measures required and performed to correct such defects.

4. The steel fabricator will make all repairs to defective work to the satisfaction of the inspector.
5. The inspector will submit reports of inspection and test findings to the Architect. Record all defects found with subsequent repair operations and submit reports to the Architect.
6. The work of the independent inspector will in no way relieve the steel fabricator of responsibility to comply with all requirements of the Contract Documents.

3.6 ADJUSTING

- A. Make final adjustments to tensile membranes and flexible structural elements as required for structural integrity, and in accordance with shapes and configuration indicated on drawings.

3.7 PROTECTION AND CLEANING

- A. Protect work from damage and deterioration during installation.
- B. Product Handling and Protection: Use all means necessary to protect structural steel before, during, and after installation and to protect the installed work and materials of all other trades.
- C. Upon completion of the ETFE system installation:
 1. ~~The Subcontractor/Installers shall to~~ clean all surfaces of the system's components in conformance with the membrane manufacturer's recommendations.
 2. Inspect the system and repair membrane panels that have become damaged. Repairs ~~shall are to~~ be executed in such a way that they ~~minimize any visually unacceptable impact are~~ visually acceptable to Architect.
 3. Inspect the system and repair membrane panels that have become damaged per manufacturer's requirements.

~~Further protection of the work and final cleaning, if necessary, shall be the responsibility of the General Contractor.~~

- D. Steel Cleaning:
 1. Cleaning and touchup steel finishes field welds, bolted connections and abraded areas are to be completed per the manufacturer's field repair recommendations.

END OF SECTION

SECTION 13 31 00.13

PTFE TENSILE MEMBRANE SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. PTFE tensile membrane system and its supporting steel and/or cable structure.
- B. The PTFE tensile membrane system provider will be a single-source entity with responsibility for the detailing, fabrication, supply, and installation of the work specified.
- C. Structural design, supply, fabrication, shipment, and erection of the following principal items:
 - 1. The PTFE membrane as indicated on the drawings and in these specifications.
 - 2. Cables and end fittings.
 - 3. Perimeter, catenary, and sectionalized aluminum clamping system.
 - 4. Structural steel, including masts, trusses, struts, beams, and/or weldments, as indicated on the drawings.
 - 5. Fasteners and gasketing.
- D. The PTFE membrane used in these structures shall be a complete system consisting of PTFE (polytetrafluoroethylene, such as Teflon® coated woven fiberglass). All references to "membrane" in this section, without exception, and whether singular, plural, capitalized or not, are to such architectural membrane.

1.2 RELATED REQUIREMENTS

- A. Section 01 13 00 - Delegated Design Requirements.
- B. Section 03 30 00-Cast-in-Place Concrete.
- C. Section 05 12 00-Structural Steel Framing.

1.3 REFERENCES

- A. General: Except as otherwise shown or noted, all work shall comply with the requirements of the following codes and standards:
 - 1. IBC (International Building Code), 2018 edition.
 - 2. American Institute of Steel Construction (AISC).
 - a. Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings
 - b. AISC 303-05 Code of Standard Practice for Steel Buildings and Bridges
 - c. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design

- d. Specification for Allowable Stress Design of Single-Angle Members
- e. AISC/ANSI 341-05 Seismic Provisions for Structural Steel Buildings
- 3. American Society of Civil Engineers (ASCE)
 - a. ASCE 19: Structural Applications of Steel Cables for Buildings
 - b. ASCE 7: Minimum Design Loads for Buildings and Other Structures
- 4. American Society of Testing and Materials (ASTM)
 - a. ASTM A586: Standard Specification for Zinc-Coated Steel Structural Strand
 - b. ASTM A603: Standard Specification for Zinc-Coated Steel Structural Wire Rope
 - c. ASTM A 780: Zinc Rich Paint Repairs
 - d. ASTM A 153: Hot Dip Galvanizing
 - e. ASTM D 4851-88: Standard Test Methods for Coated and Laminated Fabrics for Architectural Use
 - f. ASTM A 36: Carbon Steel
 - g. ASTM A307: Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - h. ASTM E84: Standard Test Method and Surface Burning Characteristics of Building Materials
 - i. ASTM 108: Standard Test Methods for Fire Tests of Roof Coverings
 - j. ASTM 136: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C
 - k. ASTM E424: Standard Test Method for Solar Energy Transmittance and Reflectance of Sheet Materials
 - l. ASTM D 1117: Testing Non-Woven Fabrics
 - m. ASTM B221-08: Standard Aluminum and Aluminum Alloy Extruded Bars
 - n. ASTM B 209: Standard Specification for Aluminum Sheet
- 5. American Welding Society (AWS)
 - a. AWS D1.1: Structural Welding Code
 - b. AWS 2.4: Symbols for Welding and Nondestructive Testing
- 6. Aluminum Association
 - a. Specifications for Aluminum Structures
- 7. National Fire Protection Association (NFPA)
 - a. NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
- 8. Steel Structures Painting Council (SSPC)
 - a. Steel Structures Painting Manual, Volumes 1 and 2

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site prior to commencing work of this section.
 - 1. Require attendance of parties directly affecting work of this section, including:
 - a. Applicable subcontractors.
 - b. Contractor.
 - c. Membrane manufacturer field representative.
 - d. Architect.
 - e. Structural engineer.

- f. Inspection and testing agency representative.
2. Review erection drawings, sequence, schedule, and procedures; tensile membrane handling, preparation, installation, adjusting, cleaning, and protection requirements, and coordination with related structural work.

1.5 SUBMITTALS

A. Action Submittals:

1. Product Data: Include manufacturer's specifications for materials, fabrication, installation, and recommendations for maintenance. Include test reports showing compliance with project requirements where test method is indicated.
2. Sample: Submit selection and verification samples.
3. Shop Drawings: For tensile membrane system. Include plans, elevations, sections, full-size details, and attachments to other work.
 - a. PTFE system drawings defining the completed structure, anchorage and connection details, interfaces with building construction, and general membrane seam arrangements.
 - b. Drawings to show all shop and erection details including cuts, copes, connection holes, threaded fasteners, bolts, studs and spacing, etc.
 - c. Drawings to show all welds, both shop and field, by the currently recommended symbols of the AWS.
 - d. A welding procedure must be submitted to the Professional Structural Engineer for approval of welds that are not prequalified.
 - e. The fabricator shall not fabricate any material until after receipt of approved shop drawings.
 - f. Certification of material conformance that includes chemical and physical properties for all structural elements shall be submitted for review.
4. Delegated Design Submittal: Tensile membrane systems, including support framing, connections, and related hardware shall be designed under the direct supervision of a Professional Structural Engineer experienced in the design of the work and licensed in the State of Mississippi, using performance and design criteria, and requirements specified in this Section.
5. Design Calculations: Submit complete calculations for the tensile membrane structure, as one package with the design drawings, signed and sealed by a Professional Structural Engineer licensed in the State of Mississippi. Structural calculations to include all required loading cases and load combinations used in the design and resulting member forces, reactions, deflections, and drift. The magnitude of maximum reactions on the supporting structures from all critical load combinations are to be separately tabulated. Critical load conditions used in the final sizing of the members shall be emphasized.

B. Informational Submittals:

1. Qualification Data:
 - a. For Installer and field testing agency.

- b. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.
 - c. Steel Fabricator: Not less than five (5) years' continuous experience in the fabrication of structural steel.
- 2. Test Reports: Provide test reports from a qualified testing laboratory that show compliance of the PTFE coated woven fiberglass tensile membrane system with specification requirements.
- 3. Certificates: Product certificates signed by the PTFE system fabricator certifying materials comply with specified characteristics, criteria, and physical requirements.
- 4. Source quality-control reports.
- 5. Sample Warranties: For special warranties.
- C. Closeout Submittals:
 - 1. Record Documents: Project record documents for installed materials in accordance with Section 01 78 39 - Project Record Documents.
 - 2. Maintenance Manual: Submit two (2) copies of a maintenance manual for the PTFE system to the Owner. Include a schedule for routine inspection, an inspection checklist, instructions for emergency repair and use of emergency repair materials, and warranty. During the system erection period, the Owner shall provide maintenance personnel to be trained in the use of the repair materials.
 - 3. Samples: Submit samples for proposed PTFE and aluminum extrusion finishes. Minimum 12" x 12" in dimension.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located; with at least ten (10) years of documented experience.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least ten (10) years of documented experience.
- C. Fabricator/Installer Qualifications: Company specializing in fabricating products specified in this section, have at least ten (10) years experience in the successful fabrication and erection of permanent, custom tensile membrane structures.
 - 1. Fabricator to have fabricated and erected at least twenty (20) tensile membrane structures, with at least five (5) structures of similar size and complexity as this project.
 - 2. Must demonstrate the company's steel fabrication capability by submitting a copy of their AESS, A660, AISC, ASTM, AWS Approved Fabricator Status.
- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least ten (10) years of documented experience and approved by manufacturer.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Materials shall be packed, loaded, shipped, unloaded, stored and protected in a manner that will avoid abuse, damage, and defacement.
- B. Deliver materials to project site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- C. Store products under cover, elevated above grade, and in dry, well-ventilated areas not exposed to heat or sunlight.
- D. Handle fabric in accordance with manufacturer's instructions.

1.8 WARRANTY

- A. PTFE Membrane Warranty: The PTFE system, its perimeter attachment system, and the structural support system as supplied have been installed in accordance with the project specifications free from defects in materials and workmanship that will impair their normal use or service.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. PTFE Support Structure Warranty: The PTFE support structure and its perimeter attachment system have been installed in accordance with the project specifications and will be free from defects in materials and workmanship that will impair their normal use or service.
 - 1. Warranty Period: 2 years from date of Substantial Completion.
- C. The warranty shall not cover defects caused by the following:
 - 1. Acts of God or other casualty.
 - 2. Damage to the Fabric caused by application of cleaners, solvents, and/or penetrations not otherwise approved in writing by Manufacturer/Installer.
 - 3. Damage occurring due to the failure to mitigate damages.
 - 4. Damage due to inappropriate repairs and maintenance.
 - a. Acts of vandalism or terrorism.
 - b. Improper modification, servicing, or operation.
 - c. Negligence or default of the Owner, or the negligence or default of any third party.
 - d. Outside interference with the System
 - e. Actions of rodents and animals.
 - f. Exceptional meteorological events
 - g. Excessive settlement or movement of the supporting structure.
 - h. Perils for which the System was not designed.
 - i. Modification or addition to the PTFE system performed without the express written consent of the subcontractor.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a Professional Structural Engineer licensed in the State of Mississippi, as defined in Section 01 40 00 - Quality Requirements, to design tensile membrane systems.
- B. General Performance: Comply with performance requirements specified, as determined by testing of tensile membrane systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- C. System Requirements:
 - 1. General: Provide an PTFE system that complies with requirements specified herein. The subcontractor shall submit a copy of test results for all tests listed in this section.
 - 2. Building Code Criteria: PTFE system to comply with the 2018 IBC (International Building Code) edition with Amendments, and the State of Mississippi authorities having jurisdiction. Controlling code and design criteria insertions below to be provided and verified by the Project Engineer.
 - a. Ground Snow Load: As indicated on Drawings.
 - b. Snow Load Importance Factor: As indicated on Drawings.
 - c. Roof Live Load: As indicated on Drawings.
 - d. Basic Wind Speed: As indicated on Drawings.
 - e. Wind Load Importance Factor: As indicated on Drawings.
 - f. Wind Exposure Category: As indicated on Drawings.
 - g. Design Mean Roof Height(s): As indicated on Drawings.
 - 3. Life Safety: All PTFE systems shall be designed so that no life safety issue is created in the event of a loss of a part of the PTFE membrane. The PTFE system supporting structure shall not rely on the PTFE membrane for structural stability.
 - 4. Fire Performance:
 - a. Burning Characteristics (ASTM E84): Class A

2.2 MANUFACTURERS

- A. The PTFE system provider is responsible for the detailing, fabrication, supply, and installation of the work specified herein.
- B. Tensile Membrane Structures:
 - 1. Basis of Design: Provide ETS - Enclos Tensile Structures Inc.; PTFE System or a comparable product by one of the follow manufacturers / fabricators / installers:
 - a. Birdair, Inc.
 - b. Fabritecture.
 - c. Lightspan.
 - d. NOVUM Structures.

2.3 ARCHITECTURAL MEMBRANE (PTFE)

- A. General: The membrane used in these structures shall be polytetrafluoroethylene ("PTFE", such as Teflon®) coated woven fiberglass. All references to "membrane" in this section, without exception, and whether singular, plural, or capitalized or not, are to such architectural membrane.
- B. Architectural Membrane General Requirements:
 - 1. Source Quality Control: The primary materials are to be obtained from a single manufacturer. Secondary materials shall be those recommended by the primary manufacturer.
 - 2. Physical Characteristics: The following indicates a range of physical property types for PTFE architectural membranes. The determination of specific characteristics and selection of a membrane shall be derived from analysis and calculations carried out by the Professional Structural Engineer for this project.
 - a. Coated Fabric Weight (oz/sq. yd): 24-45.5 nom. (ASTM 4851)
 - b. Thickness (mils): 18 – 36 nom. (ASTM 4851)
 - c. Strip Tensile (lbs./in., avg.)
 - 1) Dry, Warp (ASTM 4851): 520 min. – 975 min. avg.
 - 2) Dry, Fill (ASTM 4851): 380 min. – 900 min. avg.
 - d. Tensile after Flexfold (lbs/in., avg.)
 - 1) Dry, Warp (ASTM 4851): 375 min. – 760 min. avg.
 - 2) Dry, Fill (ASTM 4851): 350 min. – 735 min. avg.
 - e. Trapezoidal Tear (lbs. avg.)
 - 1) Warp (ASTM 4851): 35 min. – 95 min. avg.
 - 2) Fill (ASTM 4851): 35 min. – 120 min. avg.
 - f. Solar Transmission (%) (ASTM 424): 7 – 22 nom.
 - g. Solar Reflectance (%) (ASTM 424): 70 – 75 nom.

2.4 CABLE AND END FITTINGS

- A. Materials
 - 1. All structural wire rope cables shall conform to the latest revision of ASTM A603.
 - 2. All structural strand cables shall conform to the latest revision of ASTM A586.
 - 3. All cables, except stainless steel, shall be coated to "Class A" zinc coating throughout.
 - 4. All cables in contact with the membrane shall be white PVC coated. All other cables may be galvanized only.
- B. Fabrication
 - 1. Cable fabricator to provide quality control over all fabrication activities. Inspection of the place of fabrication may occur at any time to verify proper quality control. This inspection does not relieve the fabricator from meeting the requirements of this specification.
 - 2. Cables that are designated to be pre-stretched shall be pre-stretched per ASTM A603 for wire rope and ASTM A586 for structural strand. Cables of the same type shall have the same modulus of elasticity.

3. All cables shall be manufactured to the following length tolerances at 70 degree Fahrenheit (23 degrees Celsius):

Length < 70 feet (2133.6 cm)	1/4-inch (6.4mm)
Length 70 to 270 feet (8229.6 cm)	0.03% of length
Length > 270 feet (8229.6 cm)	1 inch (25.4 mm)
4. Cables shall have a continuous longitudinal paint stripe 1/8 inch (3.18 mm) wide max.) along their top surface unless noted otherwise.
5. Index markings shown shall be a circumferential paint stripe 1/8 inch (3.18 mm) wide max.).
6. All cables and end fittings shall be delivered clean and dry.
7. All swaged and speltered fittings shall be designed and attached to develop the full breaking strength of the cable. Thimble end fittings shall develop a minimum of 90 percent of the cable breaking strength.
8. Swaged end fittings, pins, nuts, and washers shall be electro-galvanized. Any damage to the zinc coating shall be cleaned and painted with gray zinc-rich paint per ASTM A 780.
9. Speltered end fittings shall be hot dip galvanized per ASTM A 153. Any damage to the zinc coating shall be cleaned and painted with a gray zinc-rich paint per ASTM A 780.

2.5 ALUMINUM CLAMPING SYSTEM

A. Materials

1. All structural aluminum clamping systems to be ASTM alloy 6061-T6.
2. Bent Plates to be formed from ASTM B221-08 alloy 6061 and then heat-treated to T6.
3. All structural "U straps" to be ASTM B221-08 Aluminum Alloy 6063, heat-treated to T5.
4. All structural aluminum clamping to have the following finish:
 - a. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Color: White..
5. Structural sheet aluminum to be ASTM B 209 alloy 5052-H32.
6. Non-structural sheet aluminum to be ASTM B 209 alloy 1100 series.

B. Fabrication

1. Aluminum fabricator will provide quality control over all fabrication activities. Inspection of the place of fabrication may occur at any time to verify proper quality control. This inspection does not relieve the fabricator from meeting requirements of this specification.
2. Fabricated aluminum will have no sharp edges.
3. Stamp all parts with the appropriate mark number.
4. All fabricated aluminum will be free of oil, grease, and machining chips.
5. Tolerances shall be as follows:

PTFE TENSILE MEMBRANE SYSTEM

- a. Cross Sectional Dimensions: $\pm 10\%$, 0.03 inch (0.8 mm)max.
 - b. Bolt Hold Locations: $\pm 1/32$ inch (0.79 mm)
 - c. Overall Length: $\pm 1/16$ inch (1.59 mm)
6. All welded joints to conform to AWS D1.2.

2.6 STRUCTURAL STEEL

- A. General: The structural steel fabrication will comply with the latest revision of all applicable codes, standards and regulations including the following:
 - 1. AISC: "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" and "Code of Standard Practice for Steel Buildings and Bridges"
 - 2. SSPC: "Steel Structures Painting Manual, Volumes 1 and 2"
 - 3. Research Council on Riveted and Bolted Structural Joints: "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts"
 - 4. AWS D1.1 and AWS A2.4
- B. In the event of conflict between pertinent codes and regulations and the requirements of the reference's standards or these specifications, the provisions of the more stringent shall govern.
- C. Materials
 - 1. Structural steel for plates and bars to conform to the requirements of ASTM A 36 or ASTM A 572, Grade 50, unless noted otherwise.
 - 2. Structural pipe to conform to ASTM A 53, Types E or S, Grade B.
 - 3. Structural tubing to conform to ASTM A 50, Grade B or C.
 - 4. Structural bolts
 - a. High Strength Bolts: ASTM A 325, unless noted otherwise
 - b. Common Bolts and Nuts: ASTM A307
 - c. Threaded Rods: ASTM A 36, unless noted otherwise
 - 5. Other materials: Provide all other materials, not specifically described but required for a complete and proper installation of structural steel.
- D. Accessories:
 - 1. Base Plates and Anchor Bolts:
 - a. Base plates supported on concrete, whether shop attached or shipped loose, shall be furnished, and set on shims or leveling plates. Grouting as required per delegated design.
 - b. Anchor bolt locations to be furnished to set the bolts in concrete prior to pour. Anchor bolts to have two (2) nuts and washers. Damaged threads shall be repaired or be cut to permit full tightening of nuts.
- E. Fabrication:
 - 1. Workmanship: All members when finished to be true and free of twists, bends, and open joints between the component's parts. Members to be thoroughly straightened in the shop by methods that will not damage them, before being worked on in any way.
 - a. Properly mark materials, and match-mark for field assembly where required.

- b. Grind all edges and corners that could contact membrane to a minimum 1/16 inch (1.6mm) radius.
- 2. Connections:
 - a. Connections shall be as indicated on the drawings. When details are not shown, the connections shall conform to the requirements of the AISC.
 - b. Provide high-strength threaded fasteners for all structural steel bolted connections, unless noted otherwise.
 - c. Combination of bolts and welds in the same connection are not permitted, unless otherwise detailed.
 - d. Welded Connections
 - 1) Definitions: All terms herein relating to the welds, welding and oxygen cutting to be construed in accordance with the latest revision of "Standard Definitions of Welding Terms and Master Chart of Welding Processes" of the AWS.
 - 2) No welding to begin until joint elements are clamped in proper alignment and adjusted to dimensions shown on the drawings and allowance for any weld shrinkage that is expected. No members are to be spliced without prior approval.
 - 3) All welding shall be done in accordance with the reference specifications, with the following modifications and additions:
 - (a) All field welding will be done by manual shielded metal-arc welding.
 - (b) All groove welds to have complete penetration, unless otherwise specified on the drawings.
 - (c) The minimum pre-heat and inter-pass temperature requirements to be as required per AWS D1.1.
 - 4) Welding Sequence: Heavy sections and those having a high degree of restraint must be welded in a sequence with the proper preheat and post-weld heat treatment such that no permanent distortion occurs. Submit a welding sequence for approval for these types of connections.
 - (a) Oxygen Cutting: Manual oxygen cutting to be done only with a mechanically guided torch. Alternatively, an unguided torch may be used provided the cut is not within 1/2-inch (12.7 mm) of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal edges. The use of oxygen-cut holes for bolted connections will under no circumstances be permitted.
- 3. Tolerances: All tolerances are per the AISC "Code of Standard Practice for Steel Buildings and Bridges".
- 4. Paint System, Two-Coat; Zinc Polyurethane:
 - a. Source Quality Control: Primary materials to be obtained from a single manufacturer. Second materials to be those recommended by the primary manufacturer.
 - b. Surface Preparation and Base Coat

- 1) Commercial blast cleaned in conformance with SSPC-SP10/NANCE 2, after all fabrication operations such as machining and welding are completed. There shall be a maximum of eight-hour time elapse between the surface preparation and the application of the primate coat.
- 2) Base Coat: Sherman Williams Macropoxy 646 PW or approved equal, @ 2.0 - 4.0 mils DFT.
 - (a) Color: Mil white or light blue.
 - (b) Comply with the composition and performance requirements of SSPC-Paint 22.
- c. Finish Coat
 - 1) Finish Coat: Sherman Williams Hi-Solid Polyurethane (semi-gloss) or approved equal, @ 3.0 - 4.0 mils DFT.
 - (a) Comply with the composition and performance requirements of SSPC-paint number 36, level 3.
- d. Finish Quality:
 - 1) The dry paint shall be uniform and continuous with no voids or puddles and shall not be broken by scratches or nicks

2.7 FASTENERS

- A. General: Provide fasteners used to secure clamp systems to curbs and cables, assemblage of clamp systems, and other fasteners as required to complete the work specified herein.
- B. Materials:
 1. All work to comply with the latest edition of ASTM standards and American Iron and Steel Institute (AISI), as referenced herein.
 2. Fasteners used in membrane clamping systems to be stainless steel. Bolts and studs to conform to ASTM F593, Type 304. Nuts to conform to ASTM F594, Type 316. Washers to be plain, narrow, and conform to AISI Type 18-8.
 3. All clamping systems subjected to relative movement between clamping and curb shall receive a split-ring lock washer conforming to AISI Type 18-8.
 4. Unless otherwise specified on the drawings, all other bolts and nuts shall conform to ASTM A307-76B, zinc plated to conform to ASTM B633 Class FE/ZN 8 type III.

2.8 GASKETING

- A. Sponge Neoprene Gasketing:
 1. Material
 - a. All sponge neoprene shall be of a cellular elastomeric compound of a firm grade, which has been manufactured in pre-formed shapes for use as gasket and sealing material, as specified in ASTM C 509.

- b. Cellular elastomeric materials furnished to this specification will be manufactured from natural or synthetic rubber, or mixtures of these, with added compounds of such nature and quality that, with proper curing, the finished product will comply with this specification.
 - c. The cured compounds shall be suitable for use where resistance to sunlight, weathering oxidation and permanent deformation under load are of prime importance.
 - d. The manufacturing process to ensure a homogeneous cellular material free of defects that may affect serviceability.
 - e. The physical characteristics of the neoprene must meet or excess ASTM C509, "Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Materials."
 - f. Certification of material to be provided that conforms to ASTM C509.
- B. Dense Neoprene Gasketing:
- 1. All neoprene material to conform to ASTM D 2000M hardness Grade 60. The material will be homogenous, free from defects and shall be compounded and cured to meet the requirements specified herein.
 - 2. All neoprene will be of non-staining formulation and consist of at least 50 percent by weight of basic rubber hydrocarbon. Material will not contain crude or reclaimed rubber.
 - 3. The physical characteristics of the neoprene must meet or exceed the following physical test requirements when tested using the standard ASTM test slab can compression set plug (or approved equal):

	PROPERTY	ASTM METHOD	UNITS
a.	Shore A Durometer	D2240	55-65
b.	Tensile Strength (Min.)	D 412	[1,100] psi ([7584.24] kPa)
c.	Percent Elongation (Min.)	D 412	300%
d.	Percent Compression Set (Max.)	D395, Method B	22hrs at 212°F 35%
e.	Heat Aging, Change from original properties:		
	Hardness Change (Max.)	+15 Points Shore A	
	Tensile Strength (Max.)		-15%
	Elongation Change (Max.)	-40%	
f.	Flame Resistance		Must not propagate flame
g.	Temperature Range		30°C to -100°C
h.	Ozone Resistance	D1171, Method A, 72 hrs @ 38oC and 50 mPa Ozone	

i.	Resistance to Oil Aging:	D471, 70hrs @ 212°F Immersion in ASTM Oil No.3	
	Tensile Strength (Max.)		-70%
	Elongation (Max.)		-55%
	Volume Change (Max.)		+120%

2.9 MAINTENANCE KIT

- A. Architectural Membrane Maintenance Kit: Provide Owner with the following materials for emergency repair or maintenance. The materials shall be neatly packaged into a maintenance kit for storage by the Owner.

QUANTITY	DESCRIPTION
6	12-inch diameter patch with FEP sheets
12	5-inch diameter patch with FEP sheets
12	4-inch x 8-inch rectangular patch with FEP sheets
6 sq. yds.	Outer Membrane
200 feet (6096 cm)	FEP tape, 3 inches (76.2 mm) wide
1	Soldering iron, 500W with wedge tip
1	Tacking sealer, 3-inch x 5-inch die
2	Insulating bearing blocks
1	5/8-inch hole punch
1	Utility knife
50	Repair clips
1	Spool of No. 36 nylon twine
36 yds.	Comar B29/4 x 15 Kevlar® thread
1	Hand awl
1 pkg.	C-29 needles
1	Repair Manual

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine area to receive flexible structural elements and tensile membrane; notify Architect if area is not acceptable and do not begin installation until unacceptable conditions have been corrected.

- B. Examine foundations and anchor bolts for location and elevation; notify Architect of inaccuracies, and do not begin installation until unacceptable conditions have been corrected.

3.2 PREPARATION

- A. Prepare a clear, flat, smooth, and clean layout area on ground of sufficient size for assembly of tensile membrane panels; prepare area adjacent to location of structure installation.
- B. Check contact surfaces to remove sharp objects, dirt, grease, oil, and other causes for rips, scratching, or other damage to tensile membrane panels during installation.

3.3 FABRICATION OF MEMBRANE PANELS

- A. General
 - 1. Installer shall take necessary care to plan and assemble the fabricated sections such that the assembly has no shop patches. Splices, if any, shall be patterned into a symmetrical and repetitive geometric arrangement within the assembly, shown on the design drawings and, where feasible, hidden by structural members.
 - 2. All fabricated joints shall have a minimum of 90 percent of the total strength of the coated membrane in strip tensile testing. All structural joints shall be fused in accordance with industry standards and shall maintain the integrity of the coating. PTFE-coated woven fiberglass membranes shall be heat-sealed only.
 - 3. Biaxial Test: At least one (1) representative sample of the outer membrane shall be biaxially test loaded.

3.4 ERECTION OF MEMBRANE ASSEMBLIES

- A. Erect tensile membrane structures and flexible structural elements in accordance with erection requirements of ASCE 55.
- B. Comply with approved erection plan.
- C. Do not undertake erection of tensile membranes during inclement weather conditions; Installer has sole responsibility to determine when conditions are safe for erection.
- D. Install tensile membranes and flexible structural elements in accordance with manufacturer's instructions.
 - 1. Install to avoid damage to tensile membranes.
 - 2. Ensure tensile membranes surfaces are smooth, uniform, and clean, with even-curved edges and interfaces, and with no cuts, scratches, abrasions, stains, marks, blemishes, or welding irregularities.
- E. Erection of Structural Steel:

1. All precautions shall be taken to ensure an accurately located and completely safe and stable structure at all times. Adequate guy cables shall be used throughout the work and all erection bolts shall be drawn up tight.
2. All steel to be accurately aligned before permanent connections are made.
3. Temporary bracing is to be left in place as long as may be required for safety. The bracing shall be located so it does not interfere with the erection for the tensile membrane structure and can be removed as required during construction.
 - a. The structure is to be self-supporting and stable after the structure is fully completed.
4. Erection tolerances shall be specified in the AISC "Code of Standard Practice for Steel Buildings and Bridges", unless otherwise noted.

3.5 FIELD QUALITY CONTROL

A. Testing:

1. Owner to engage an independent testing laboratory to perform testing and inspection of the structural steel and welding. All welds to be tested by visual, dye penetrant, magnetic particle methods, or ultrasonic methods.
2. The fabricator/installer and the testing laboratory inspector shall be permitted to inspect the work in the shop or field throughout fabrication and erection.
3. The inspector will check for workmanship of steel, both in the shop and field, and check general compliance with the Contract Documents and steel shop drawings. The inspector will record types and locations of all defects found in the work and measures required and performed to correct such defects.
4. The steel fabricator will make all repairs to defective work to the satisfaction of the inspector.
5. The inspector will submit reports of inspection and test findings to the Architect. Record all defects found with subsequent repair operations and submit reports to the Architect.
6. The work of the independent inspector will in no way relieve the steel fabricator of responsibility to comply with all requirements of the Contract Documents.

3.6 ADJUSTING

- #### A.
- Make final adjustments to tensile membranes and flexible structural elements as required for structural integrity, and in accordance with shapes and configuration indicated on drawings.

3.7 PROTECTION AND CLEANING

- #### A.
- Protect work from damage and deterioration during installation.
- #### B.
- Product Handling and Protection: Use all means necessary to protect structural steel before, during, and after installation and to protect the installed work and materials of all other trades.

- C. Upon completion of tensile membrane structure installation:
 - 1. Installer to clean all surfaces of the system's components in conformance with the membrane manufacturer's recommendations.
 - 2. Inspect the system and repair membrane panels that become damaged. Repairs shall be executed in such a way that they are visually acceptable.
- D. Repairs:
 - 1. Inspect the system and repair membrane panels that have become damaged per manufacturer's requirements.
 - 2. Repairs shall be neatly made and shall not exceed 12 inches (304.8 mm) in diameter. Repairs shall be limited to one of each 3,000 sq feet (3.22928 sq cm) of fabric and no more than 10 repairs for the entire shade structure system to Architect.
- E. Steel Cleaning:
 - 1. Cleaning and touchup steel finishes field welds, bolted connections and abraded areas are to be completed per the manufacturer's field repair recommendations.

END OF SECTION